MACHINERY

Design—Construction—Operation

Volume 43 | FEBRUARY, 1937 | Number 6

PRINCIPAL ARTICLES IN THIS NUMBER

FOR COMPLETE CLASSIFIED CONTENTS, SEE PAGE 428-F

DEPARTMENTS

How to figure the actual returns from investment in cost-reducing machines and tools—or the actual losses due to using obsolete equipment—will be the theme of the leading article in March MACHINERY. A practical working formula will be presented that will find wide application.

April MACHINERY — the Annual Automotive Number —will feature some of the most recent practices in a number of leading automobile plants, describing ingenious methods applicable in many other branches of the mechanical industries.

PUBLISHED MONTHLY BY

THE INDUSTRIAL PRESS

148 Lafayette Street New York

ROBERT B. LUCHARS. . . . . *President*
EDGAR A. BECKER. . *Vice-pres. and Treasurer*
ERIK OBERG . . . . . *Editor*
FRANKLIN D. JONES. . . . . *Associate Editor*
CHARLES O. HERB. . . . . *Associate Editor*
FREEMAN C. DUSTON . . . . *Associate Editor*

LONDON: 52-54 High Holborn
PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, $3 (two years, $5); foreign countries, $6. Single copies, 35 cents.
Changes in address must be received by the fifteenth of the month to be effective for the forthcoming issue.
Send old as well as new address.

Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America. Member of A.B.P. Member of A.B.C.

CIRCULATION 15,785

★

QUALITY FIRST IN CINCINNATI

Mechanical Cincinnati is methodical. It appreciates the value of old-fashioned, manual skill and exacting craftsmanship. These attributes have earned a world-wide acceptance for Cincinnati-made tools, tools with an outstanding feature—that of Quality-First!

All that is typical of methodical Cincinnati is typical of Lodge & Shipley. All that is old and fine, accurate and precise . . . all that is modern and boosts production . . . all that is scientifically sound and practical . . . all these Quality-First features make possible the interesting performance records of Lodge & Shipley Lathes—the L & S Manufacturing Lathe—the L & S Tool Room Lathe—the famous L & S Duomatics. Look to Cincinnati—to Lodge & Shipley—for "Quality-First"!

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO

The attractive Union Terminal in Cincinnati is one of the nation's most beautiful examples of modern architecture.

"The World Turns Best on LODGE &

MACHINERY

Volume 43 NEW YORK, FEBRUARY, 1937 Number 6

Bending Coils of Tubing by Production Methods

The Extensive Use of Coiled Tubing in Heating and Refrigerating Equipment Has Led to the Development of Highly Efficient Bending Methods by the Wolverine Tube Co.

By CHARLES O. HERB

THE usual practice in bending tubing into coils in the past has been to fill the tube with sand, rosin, or some similar substance that prevents buckling or flattening of the tube as it is bent around a form of suitable diameter. With this method, it is necessary to close the ends of the tube to confine the sand during the bending process, and at the completion of the operation the tube has to be cleaned out.

This method is too slow and expensive when coils are required in large quantities. Another disadvantage when the coils are to be used in refrigerating apparatus is the difficulty of completely removing the sand used to prevent buckling. In a number of instances, the presence of sand in the tube coils has resulted in expensive damage to refrigerating equipment.

The disadvantages of this method of tube bending led to the development of a process in which either an arbor of rounded form or a ball is employed to support the inside of the tube when it is necessary to guard against buckling in bending to

a comparatively small radius. This principle is used extensively by the Wolverine Tube Co., Detroit, Mich., which is the largest concern in the United States devoted exclusively to the manufacture of brass and copper tubing. Coils of a large variety of shapes are made by this company from tubing as small as 1/16 inch in diameter and as large as 2 inches.

Bending Tubing around a Plain Cylindrical Mandrel

One of the simplest methods of bending a coil is illustrated in Fig. 3. Because the diameter of this coil is fairly large with respect to the size of the tubing, the coil can be formed on a plain cylindrical mandrel, mounted on the headstock of a lathe. At the beginning of the operation, the tube is slipped over a round-end arbor to prevent it from buckling. This arbor is mounted on a rod that is fastened to a stand located at a sufficient distance from the lathe to accommodate the length of tubing required for the coil. The forward position of this bending arbor is adjusted in making a set-up, so that it is slightly in advance of the center of the lathe mandrel.

When the tube has been slipped over the arbor as described, a suitable lubricant is poured into it to facilitate bending, after which the front end is clamped to the overhanging end of the mandrel. Bending of the coil is then performed by merely starting the lathe, the tube being wound automatically on the mandrel. When space is desired between the successive turns of a coil, a spacer bar is used as shown. This bar is mounted on a sleeve which surrounds the tube being bent and the arbor rod within it. A tightly wound coil is obtained when a spacer bar is not used.

When the coil has been wound to the desired length, which is usually done with reference to a stop on the mandrel, the lathe spindle is reversed to free the coil from the arbor. It can then be easily slipped off. Starting and stopping can be effected instantly by means of a foot-treadle, which controls the operation of a magnetic brake and clutch.

In the operation shown in Fig. 3, a coil of 5 inches mean diameter is being formed to a length of approximately 12 inches from 1/2-inch tubing. The diameter of the mandrel must be somewhat smaller than the required inside diameter of the coil, in order to compensate for spring in the finished coil when it is released from the mandrel.

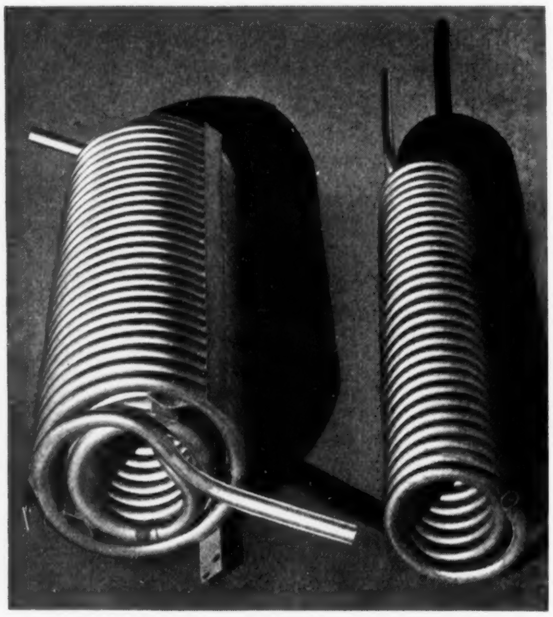


Fig. 1. Simple Coil of Copper Tubing at Right, and a Double Coil Made from One Continuous Piece of Tubing, at Left

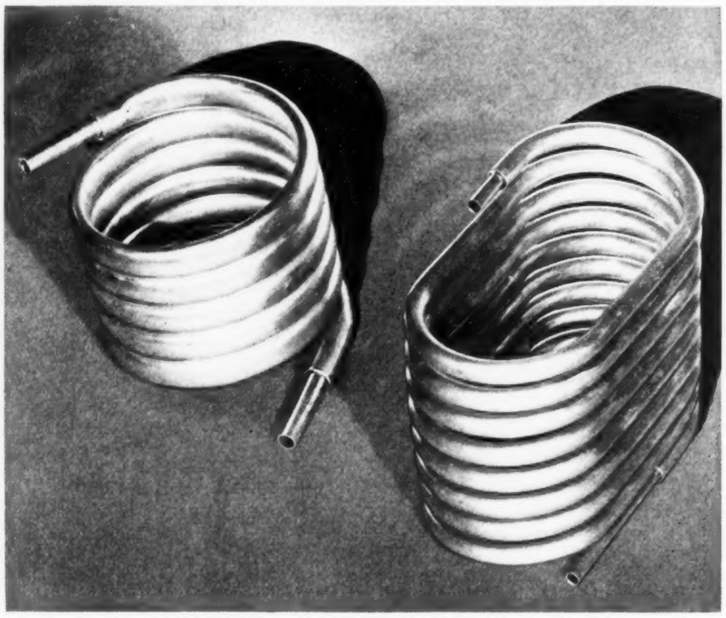


Fig. 2. Circular and Rectangular Coils for Refrigerating Apparatus, Both of which Consist of Two Tubes, One Telescoped within the Other

Producing a Double Coil from a Single Piece of Tubing

Double coils of the type seen at the left in Fig. 1 are often produced from a single piece of tubing by first bending the inner coil in the manner described, then slipping a sleeve *A*, Fig. 4, over the coil and winding the second coil on top of the sleeve; the winding is done from the headstock toward the overhanging end of the sleeve, as seen in the illustration. In this operation, the tubing is fed to the under side of the sleeve and the lathe spindle is rotated counter-clockwise, whereas in bending the inner coil, the tubing is fed to the top

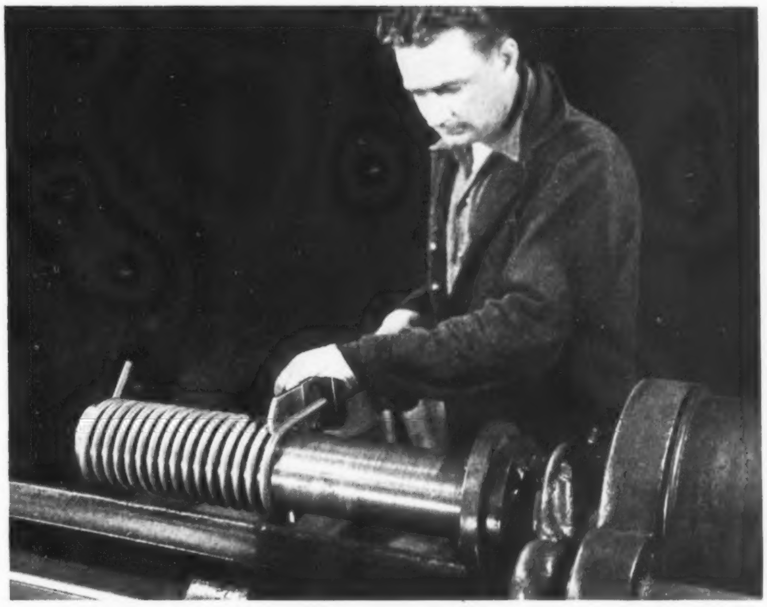


Fig. 3. Coils of which the Diameter is Large in Proportion to the Size of the Tubing are Wound around Plain Cylindrical Mandrels

of the mandrel and the lathe spindle is revolved clockwise. Coils having a total length of 70 feet or longer can be made in this way. The sleeve has a notch to receive the section of tubing that joins the tube coils at the headstock end. This notch also serves to lock the sleeve in place for the operation.

Large Tubing is Bent around Grooved Mandrels

In bending tubing of large sizes, it is necessary to use a grooved mandrel, in addition to the support on the inside of the tube, to prevent the tube from buckling. Such an operation is shown in the heading illustration. The bending principle is the same as that involved in the operations shown in Figs. 3 and 4, but use is made of a ball toggle, such as seen in Fig. 5, to guard against buckling of the tube wall.

This device consists of two balls joined together with a stud. One of the balls is held in the peened-over end of a sleeve attached to the long rod over which the tube is slipped at the beginning of the operation. In an operation on large tubing, it is necessary for the operator to exert considerable pressure on the tube with one hand in order to keep the stock from bowing upward. The coil being produced in the heading illustration measures 4 inches in mean diameter and is made of 1-inch tubing having a wall thickness of 0.032 inch.

When the rotation of the lathe spindle is reversed at the end of an operation on a grooved mandrel, the coil of tubing is unscrewed from the grooves automatically. The tailstock center must, of course, be disconnected from the end of the mandrel. This is accomplished quickly through the use of a specially designed tailstock which is hinged, so that its upper part can be swung toward the back of the lathe bed. It is unnecessary to shift the position of the tailstock along the bed.

Fig. 4. Double Coils are Produced by Winding the Outer Coil around a Sleeve that is Placed over the First Coil

Fig. 5. In Bending Coils from Tubing of Large Diameter, a Ball Toggle Placed inside the Tube Prevents Buckling

Coils of "hourglass" shape shown being bent in Fig. 6 are wound on mandrels made in two pieces that can be separated endwise upon the completion of an operation to permit the coil to be slipped off. The mandrel castings are mounted on an arbor which is held between the centers of the lathe. The mandrel section nearest the tailstock is fastened to the bar by means of a C-washer which is slipped between the mandrel and a hexagonal head on the arbor. It will be noted that the mandrel is stepped on the outside surface instead of being grooved.

Bending a Tube within a Tube

Coils consisting of two tubes, one within the other, are produced for refrigerating apparatus. This type of coil is illustrated in Fig. 2. When such coils are placed in service, the liquid to be cooled may be pumped through the inner tube and a refrigerant through the outer tube, or vice versa. An important requirement of these coils is that the inner tube hug the wall of the outer tube closely at the bends. If there should be clearance, the tubes would knock against each other at these points when the liquids were pumped through them and make considerable noise.

Rectangular coils of this type are produced by means of the hand-operated bending fixture illustrated in Fig. 7. Prior to making each bend, the tube is clamped between the stationary form *A* and a block *B*, both of which have a groove to suit the outside diameter of the tube. A loose grooved block *C* is placed between the extended straight section of the tubing and a roller attached to the front end of lever *D*. Bending is accomplished by swinging this lever and block *C* through 180 degrees. Upon the completion of each bend, clamp *B* is released and the tubing is pulled forward the required amount for the next bend. Clamp *B* is then retightened. No arbor is needed to prevent buckling.

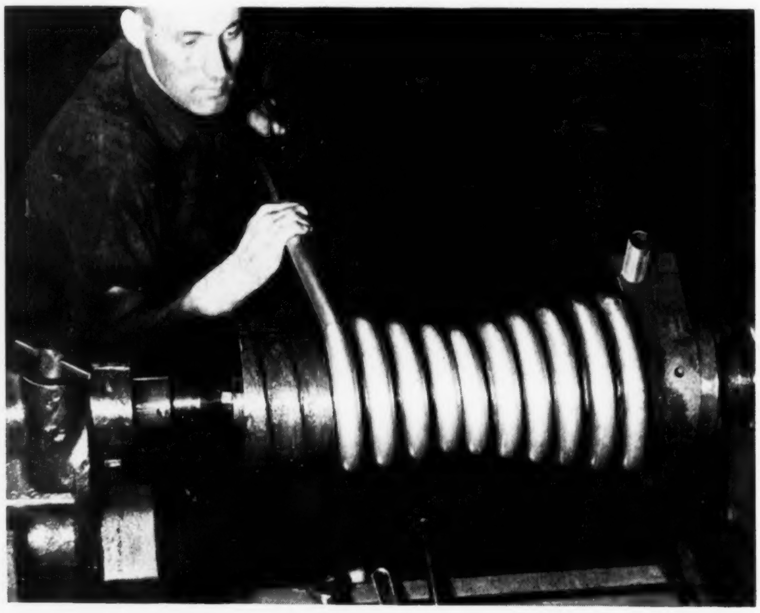


Fig. 6. Tube Coils of "Hourglass" Shape are Formed on Mandrels that can be Separated Endwise

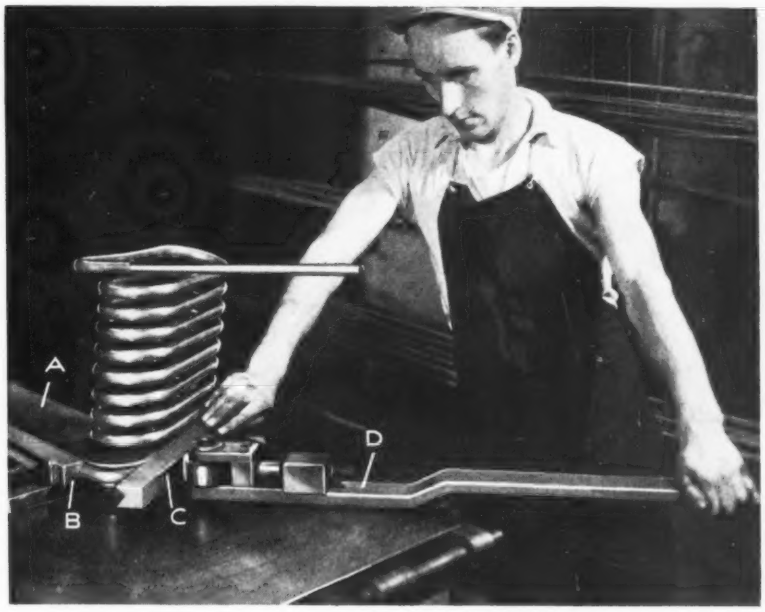


Fig. 7. Hand-operated Fixture Used in Producing Refrigerating Coils that Consist of Two Tubes, One within the Other

To insure that the inner tube will be tight against the wall of the outer tube at all bends, tension is applied lengthwise between the inner and the outer tubes.

Making U-Bends to Close Centers

Short lengths of tubing are bent in large quantities to U-bends of close centers by means of the hand-operated fixture shown in Fig. 8. Because of the small radius of the bend, it is necessary to provide a supporting arbor within the tube, which is attached to the front end of rod *A*. At the beginning of the operation, the fixture is, of course, swung forward from the position shown, so that the center of the grooves in form *B* and block *C* are directly in line with the center of the groove in block *D*.

After a piece of tubing has been clamped between form *B* and block *C* by operating handle *E*, the fixture is swung through 180 degrees by means of lever *F*. To facilitate the operation, Timken roller bearings are used for the spindle on which the fixture swivels, and a needle roller bearing for the clamping cam that is operated through handle *E*. Each tube is lubricated prior to this operation, as in the case of the coiling operations in which arbor supports are used within the tube to prevent buckling.

* * *

According to the Copper & Brass Research Association, the Hildesheim cathedral in Germany has the oldest copper roof in existence. It was put on in 1320—more than 600 years ago. During the World War, all copper roofs in Germany were removed to be used in ammunition manufacture; but that of the Hildesheim cathedral and of one other church were spared.

Fig. 8. U-bends on Close Centers are also Produced by the Use of a Hand-operated Fixture

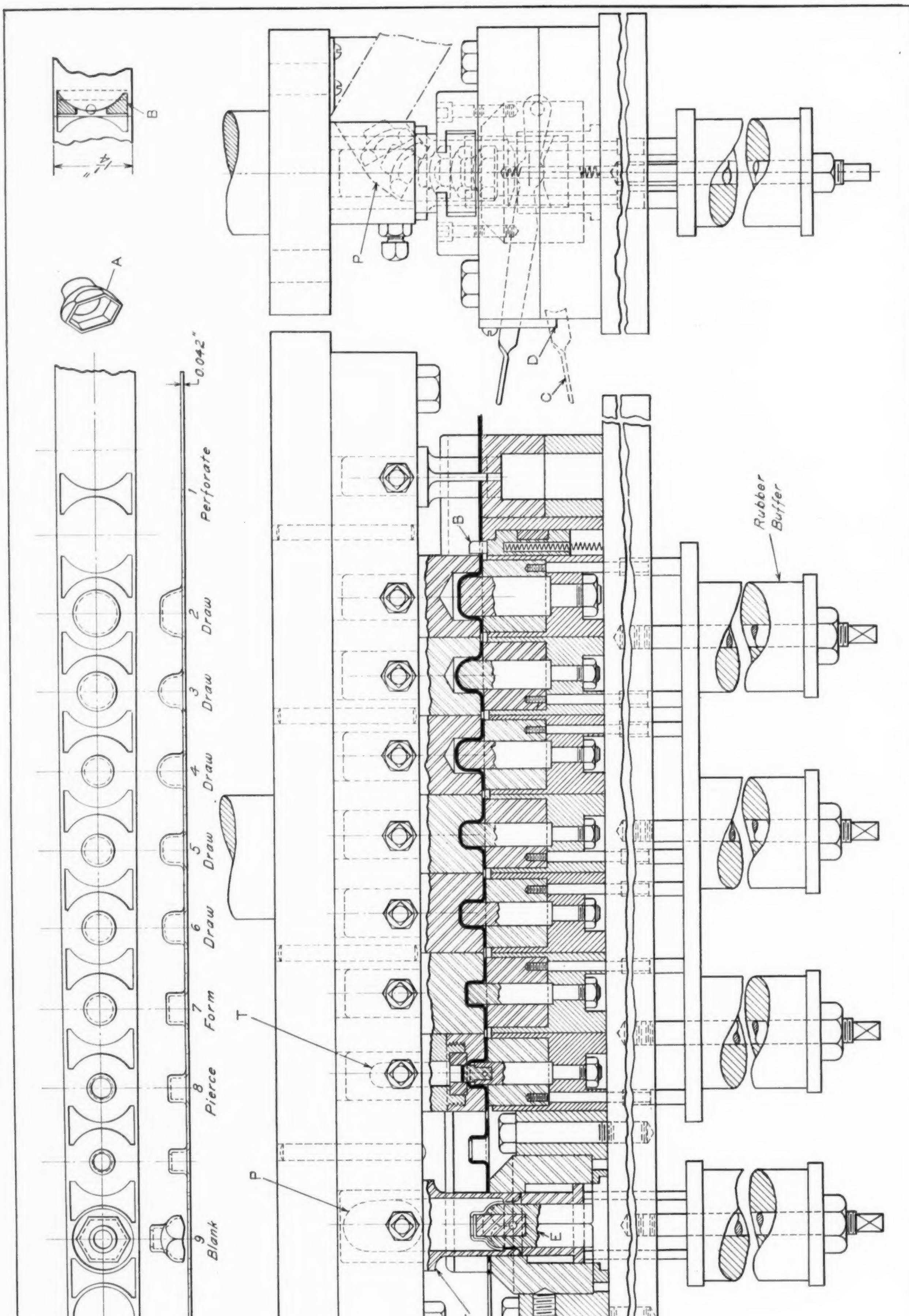


Fig. 1. Nine-station Progressive Die with Work-escape Port P at Blanking Station where Part is Formed to Shape Shown at U, Fig. 2

Dies for a Tubular Piece with Hexagon Base

By EDWARD LAY

THE part having a tubular stem and hexagon base shown at *A* in Figs. 1 and 2 is made in one piece from coil stock 0.042 inch thick. Two major operations are necessary for the production of this piece. The first is performed in a progressive gang die on an inclined power press equipped with a roll feed and operated at a speed of 70 revolutions per minute. The die is of the built-up type, with each section easily accessible. The stock stop-gage *B*, Fig. 1, is only used for performing the various steps individually when starting a new coil. As soon as the web strip of the scrap stock has passed between the rolls of the roll feed, the press will run continuously. For continuous operation, the stop actuating lever is securely fastened in the position shown at *C* by the latch *D*. This serves to move the gage points shown at *B* out of the path of the strip stock.

The need for a positive knock-out, such as is usually applied to the punch that blanks the work out from the strip stock, is entirely eliminated in this die. The knock-out is replaced by the work-escape port *P* through which the work passes freely into a chute that leads to a container at the rear of the press. At first it might appear that the work would become jammed in the escape port, but the inclination of the press at an angle of 30 degrees and the continuous reciprocation of the press ram prevents clogging.

On the down stroke, the upper edge or shoulder inside the punch *F* passes down over the lower edge of the hexagon base of the work, and on the up stroke it strips the work from the hexagonal post *E*, carrying it along in the punch. This arrangement has proved to be much better than the one previously used, in which a positive knock-out was employed. With the present design, the strain in the drawing punch *F* is greatly reduced, thus considerably prolonging the life of the punch. The scrap pieces from the piercing punch pass into an escape port *T* to the rear of the press, from which they fall into a separate receptacle.

The shaping die, shown in Fig. 2, which is employed for the second operation, is completely automatic, and is run at a speed of 75 revolutions per minute. The work from the first-operation die in the form shown at *U* is put into a hopper of the flat disk type, from which it enters a chute leading to the feed dial *V*, which, in turn, carries the work over the die nest. The dial

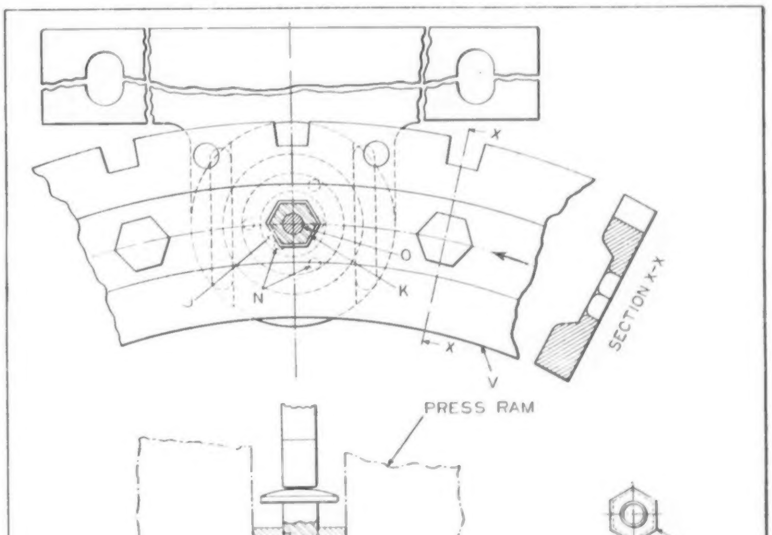


Fig. 2. Die Equipped with Dial Feed, which Receives Pieces U from Hopper and Finish-forms them to Shape Shown at A

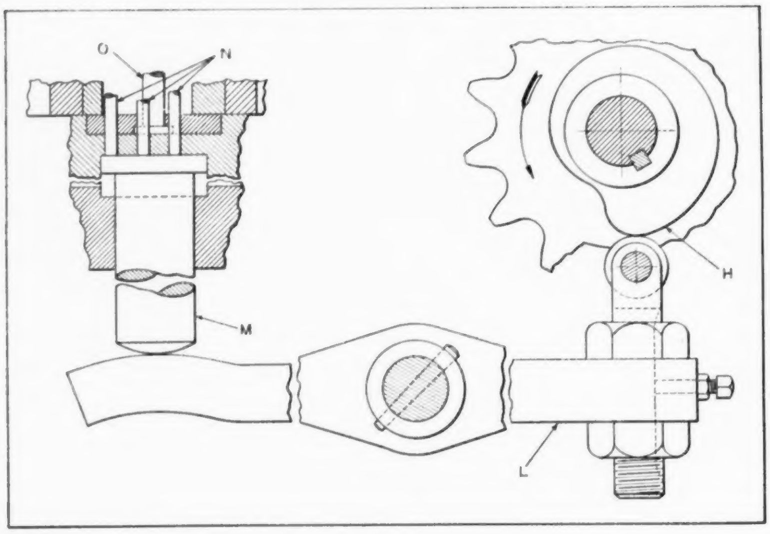


Fig. 3. Work-ejecting Mechanism for Operating Lower Knock-out of Die Shown in Fig. 2

is still in motion when the ram starts to descend; and at the moment of indexing, pilot G reaches the top of the work, preventing it from falling over.

The cam H, Fig. 3, is so timed that the moment the mouth of the hexagonal punch I, Fig. 2, touches the stem of the work, the stripper J and post K drop down to their solid supporting bases. At this point, the work is pressed into its final shape. The cam H is keyed to a shaft driven by a chain and sprocket, the driving sprocket being keyed to the crankshaft. When the press ram begins to ascend, the work is forced upward by the action of cam H, lever L, plunger M, and the pins N.

At the highest point of the cam, the pilot starts to move, again carrying the work along until an opening in the press table is reached, where the piece drops through into a container. The lower pilot O, which sizes the hole in the stem of the work to the required diameter of 0.375 inch, remains stationary at all times. This die and equipment must be carefully set up, in order to obtain smooth, continuous operation; but when this is properly done, the machine will operate for days without any trouble.

Gear Cost-Estimating

AT the last annual meeting of the American Gear Manufacturers' Association, G. Russell Holbrook, engineer with the Charles E. Crofoot Gear Corporation, South Easton, Mass., read a paper on gear cost-estimating, from which the following paragraphs are abstracted.

The basis of the company's method of gear cost-estimating is the machine hour rate, which includes direct labor cost and the proportionate burden charges allocated to the machine. The burden charge is carefully distributed over the machine equipment on a basis that takes into account the cost of the machine, rent of the space occupied, power consumption, depreciation, indirect labor charges, and indirect expenses, such as heat, light, insurance, taxes, shipping, inspection, administration, and sales expense. The machine hour rates are based on a normal operating schedule and are subject to change for over-time.

The methods here briefly outlined are used in a comparatively small shop where there is the closest possible tie-up between the cost accounting, cost keeping, engineering, and estimating departments.

The first step in preparing an estimate is to make up an operation schedule based on a comprehensive knowledge of the available equipment best adapted for making the gears under consideration. The second step is a time study to establish production time for the various operations. The estimators have a working knowledge of the various machines, of the machining qualities of the materials used, and of the speeds and feeds that can reasonably be expected to be maintained for the various operations. From the estimated production per hour and the machine hour rate, operation costs are obtained, to which are added set-up costs and material costs.

On the estimate form there is a space for tool charges. If the work requires special hobs, cutters, tools, or fixtures, this expense may be quoted in two ways: (1) The customer may be charged only a part of the cost of these tools, with the idea that they will become permanent equipment and are part of the general operating expense; (2) the customer may be quoted the entire cost of these special tools as a separate non-recurring tool charge, to be paid for against the first order.

All cost and production records of past completed work are constantly available to the estimators. Many estimates are made up by comparing the new work with previous work of similar nature. The cost cards on record show both the actual and the estimated production, and have notations of any unusual variations in production. If a previous job has shown a loss, due to factors beyond the control of the management, this fact is brought out and analyzed.

If the order is received, a close watch is kept on the actual production, as compared with the estimated production. Where there are any important variations in production, the reason is immediately investigated.

MACHINERY'S DATA SHEETS 339 and 340

PROPERTIES OF ALUMINUM DIE-CASTING ALLOYS AND ALLOY FORGINGS

TABLE 1 —CHEMICAL COMPOSITION AND TYPICAL MECHANICAL PROPERTIES[1] OF DIE-CASTING ALLOYS[3]

Alloy	Nominal Chemical Composition[2]			Ultimate Strength Lbs. per Sq. In.	Elongation Per Cent in 2 Inches
	Copper	Silicon	Nickel		
13	...	12.0	....	33,000	1.3
81	8.0	3.0	....	32,000	1.3
82	4.0	5.0	....	44,000	0.2
83	2.0	3.0	....	30,000	3.5
85	4.0	5.0	....	35,000	3.0
93	4.0	2.0	4.0	32,000	1.0

(1) Tensile properties are average of values obtained from A.S.T.M. standard round die-cast test specimen, ¼ inch in diameter. Brinell Hardness obtained from A.S.T.M. standard flat die-cast test specimen, ⅛ inch thick, using 125 kg. load and 5mm. ball.

(2) Young's modulus of elasticity for all of the above alloys is approximately 10,300,000 pounds per square inch.

(3) The composition and chill casting of many of these alloys are patented.

TABLE 2 —MECHANICAL PROPERTIES SPECIFICATIONS FOR ALUMINUM ALLOY FORGINGS*

Alloy	Minimum Tensile Strength Pounds per Square Inch	Yield Strength (Set = 0.2%) Pounds per Square Inch Minimum	Minimum Elongation Per Cent in 2 Inches**	Brinell Hardness 500 kg.-10mm. ball Minimum
14S-T	65,000	50,000	10	130
17S-T	55,000	30,000	16	90
18S-T	55,000	35,000	8	90
25S-T	55,000	30,000	16	90
32S-T	52,000	40,000	5	110
51S-T	40,000	30,000	12	90
A51S-T	43,000	34,000	12	90
53S-T	36,000	30,000	16	75
70S-T	50,000	40,000	16	..

*Applies to forgings up to 4 inches in diameter or thickness.

**The gauge length for the measurement of elongation shall be four times the diameter of the test specimen in case a sub-size test specimen is used.

Compiled by and Published with the Permission of the Aluminum Company of America

MACHINERY'S Data Sheet No. 339, New Series, February, 1937

PROPERTIES OF ALUMINUM PERMANENT-MOLD ALLOYS

ALLOY	Approximate Composition—Per Cent of Alloying Elements; Aluminum and Normal Impurities Constitute Remainder						Minimum Ultimate Strength Pounds per Square Inch	Minimum Elongation Per Cent in 2 Inches	Brinell[2] Hardness	Typical Density Pounds per Cubic Inch
	Copper	Iron	Silicon	Zinc	Magnesium	Nickel				
43	...	..	5.0	..	...	..	21,000	2.5	45–55	0.097
A108	4.5	..	5.5	..	...	..	24,000	..	65–80	0.100
112	7.5	1.2	...	1.5	...	..	23,000	..	70–90	0.104
B113	7.5	1.2	1.5	..	...	..	24,000	..	70–90	0.103
C113	7.5	1.2	4.0	1.5	...	..	24,000	..	70–90	0.103
122–T52	10.0	1.2	...	..	0.2	..	27,000	..	95–125	0.104
122–T65	10.0	1.2	...	..	0.2	..	38,000	..	125–150	0.104
122–T551	10.0	1.2	...	..	0.2	..	30,000	..	125–150	0.104
122–T552	10.0	1.2	...	..	0.2	..	27,000	..	100–125	0.104
A132–T4	0.8	0.8	12.0	..	1.0	2.5	30,000	..	90–120	0.097
A132–T551	0.8	0.8	12.0	..	1.0	2.5	30,000	..	85–115	0.097
138	10.0	1.2	4.0	..	0.2	..	26,000	..	85–110	0.105
142	4.0	..	...	..	1.2	2.0	26,000	..	90–115	0.100
142–T61	4.0	..	...	..	1.2	2.0	40,000	..	100–130	0.100
142–T571	4.0	..	...	..	1.2	2.0	33,000	..	90–120	0.100
144	10.0	..	4.0	..	0.2	..	26,000	..	85–110	0.105
144–T4	10.0	..	4.0	..	0.2	..	36,000	..	100–130	0.105
B195–T4	4.5	..	2.8	..	...	..	33,000	4.5	70–90	0.101
B195–T62	4.5	..	2.8	..	...	..	42,000	..	90–110	0.101
D195–T4	5.5	..	0.7	..	...	..	35,000	5.0	60–80	0.102
A214	...	..	...	2.0	3.75	..	21,000	2.5	50–65	0.096
355–T4	1.2	..	5.0	..	0.5	..	31,000	4.5	70–85	0.097
355–T6	1.2	..	5.0	..	0.5	..	36,000	1.5	85–100	0.097

(1) Properties obtained from standard ½-inch diameter test specimens, individually cast in a permanent mold, and tested without machining off the surface. The compositions and/or heat treatment and the chill casting of many of these alloys are patented.

(2) Brinell limits obtained from tests on commercial castings. For 122 and 142 alloys, values apply to readings taken on piston head ½ inch from edge and ½ inch from gate on pistons having thickness of head up to ½ inch. Thicker castings, castings poured with sand core or poured in sand give lower values, the maximum decrease being about 20.

(3) Young's modulus of elasticity is approximately 10,300,000 pounds per square inch.

Compiled by and Published with the Permission of the Aluminum Company of America

MACHINERY'S Data Sheet No. 340, New Series, February, 1937

Development of Radiant-Tube Heating for Industrial Furnaces

By W. M. HEPBURN
Vice-President and Chief Engineer
Surface Combustion Corporation, Toledo, Ohio

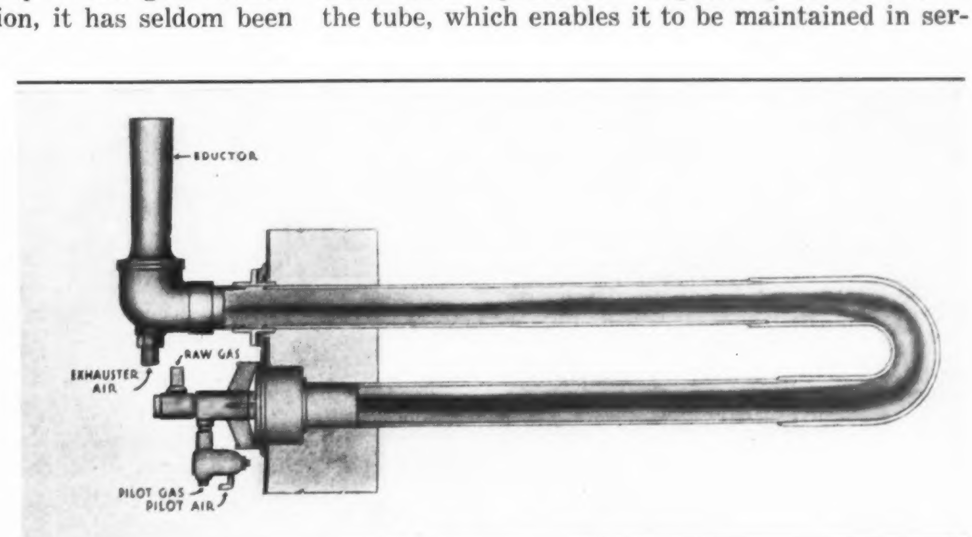
ONE of the most outstanding recent developments in industrial furnace construction is the radiant-tube heating system. This development and the improved "atmosphere gas producers" now available have gone a long way toward meeting the demands of industry for large continuous furnaces that are capable of heat-treating without oxidation, or with controlled oxidation, as is sometimes required.

With the radiant tube, it is possible to obtain a high rate of heat transfer, the rate of radiation being proportional to the fourth power of the temperature difference between the work and the heat source; whereas the heat transferred by convection—that is, in a non-luminous system—is proportional to the first power of the difference in the temperature. The radiant-tube heating element as developed by the Surface Combustion Corporation, Toledo, Ohio, is an application of the process of combustion known as diffusion combustion. In principle, diffusion combustion utilizes the characteristics of two gases to intermingle or diffuse through their molecular activity. Strata of air and gas are made to travel in parallel formation adjacent to each other at equal velocity without turbulence. Actually, under laboratory conditions, flames have been projected 84 feet by this system; theoretically, however, they can be projected much further.

True diffusion combustion requires a condition where no turbulence is set up in the gas stream. In practical furnace operation, it has seldom been possible to maintain a true diffusion type of combustion. The shape of the furnace, the varied nature of the work to be heated, the location of doors and conveyors, all conspire to set up turbulence. Therefore, while it is possible to approach the desired condition, it is seldom fully attained. Firing gases within a tube in the manner indicated by the accompanying illustration, however, represents the most practical condition under which diffusion combustion can be carried on.

The tubes, of course, are made of a heat-resisting alloy, the development of which, through the cooperation of the furnace manufacturer and the maker of the alloy, is an important achievement. The usual tube is 3 to 4 inches in diameter and from 10 to 40 feet in length. It is made in a "U" shape, as illustrated, with the two ends located outside the furnace walls. At one end is the burner, or, more correctly, the mixer, where the gas and air are mixed and combustion started. As the air-gas mixture passes through the tube, it burns progressively until at the exit of the tube it is completely burned. This progressive combustion gives the tube a very uniform temperature throughout its entire length. Thus there are no hot spots in the tube, and, with the proper arrangement of the tubes, there are no hot spots in the furnace.

At the other end of the tube there is a small stack or eductor which draws in the air for combustion and also draws the burned gases from the tubes. This eductor provides a negative pressure within the tube, which enables it to be maintained in ser-



Diagrammatic View, Illustrating Operation of the Radiant-tube Heating Element

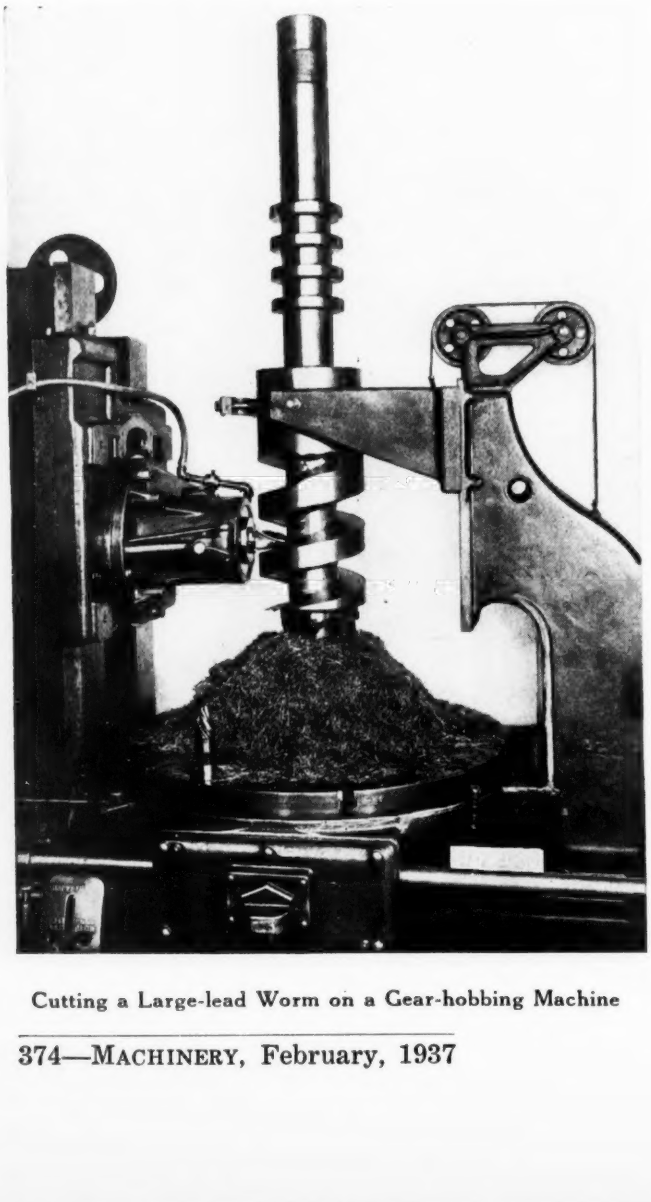
vice, even though a small leak should develop, as the products of combustion cannot escape into the furnace chamber. Thus repairs or replacements can be postponed until they can be made conveniently.

Radiant-tube heating systems are finding their way into almost every type of heat-treating system. Installations have been made for hardening, annealing, spheroidizing, normalizing, and malleableizing. One of the most recent and outstanding applications of the radiant tube is a furnace now in process of being erected for malleableizing in a large malleable iron plant in Michigan. It is believed that this furnace, when completed, will be the largest radiant-tube furnace in existence. The heating chamber has an internal width of 15 feet 4 inches and a length of 99 feet. The operating cycle of the new furnace will be approximately 31 hours, as compared with the 2 1/2- to 3 1/2-day cycle previously required. This furnace has a net capacity of 4400 pounds per hour, and a gross capacity of 6200 pounds per hour.

Cutting a Single-Thread Worm of Large Lead

By U. SETH EBERHARDT, Vice-President
Newark Gear Cutting Machine Co., Newark, N. J.

MULTIPLE-THREAD worms having large leads can usually be cut in standard machines without difficulty, but the cutting of a single-thread worm of large lead like the one shown in the accompanying illustration presents rather an unusual problem, especially when the expense for special tools or fixtures must be kept at the minimum. However, the Newark No. 5 hobbing machine made it possible to cut this worm without obtaining any special gearing or expensive equipment.



Cutting a Large-lead Worm on a Gear-hobbing Machine

The dimensions of the worm are as follows: Outside diameter, 11 3/4 inches; bottom diameter, 5 1/2 inches; length of face, 25 inches; lead, 6 1/4 inches; helix angle, 12 1/2 degrees. The shaft is 8 feet long over all and has the worm located in the middle position. The length of the shaft, in conjunction with the small diameter, prevented the worm from being cut the full length in one setting. First, the worm was cut for a distance of about 18 inches, as shown in the illustration. Then the blank was reversed for cutting the short remaining portion of the worm. No trouble was experienced in matching the finishing cuts.

The end-mill used in cutting the worm was made with a large-angle flute. This gives a shearing cut and permits heavy feeds. The depth of the first roughing cut was 2 inches, and the feed 1 inch per minute. The only extra work required to equip the machine for cutting this worm was the making of the end-mill and the bushing to hold the work on the machine table.

* * *

Hard-Facing Diesel Engine Cams

In overhauling a Diesel engine in a boat, a Southern river boat line decided to make the engine reversible. To do this, a complete new set of cams had to be made. New patterns were made, steel cams cast, and their wearing surfaces protected by a layer of wear-resistant alloy. The alloy was applied by oxy-acetylene welding about 1/16 inch thick at the point where the cam began lifting. At the top of the lift, the alloy was applied 1/8 inch thick, and was tapered down on the release arc. It is expected that these cams will last for the life of the engine.

Multiple Punching of Radiator Shells and Fenders

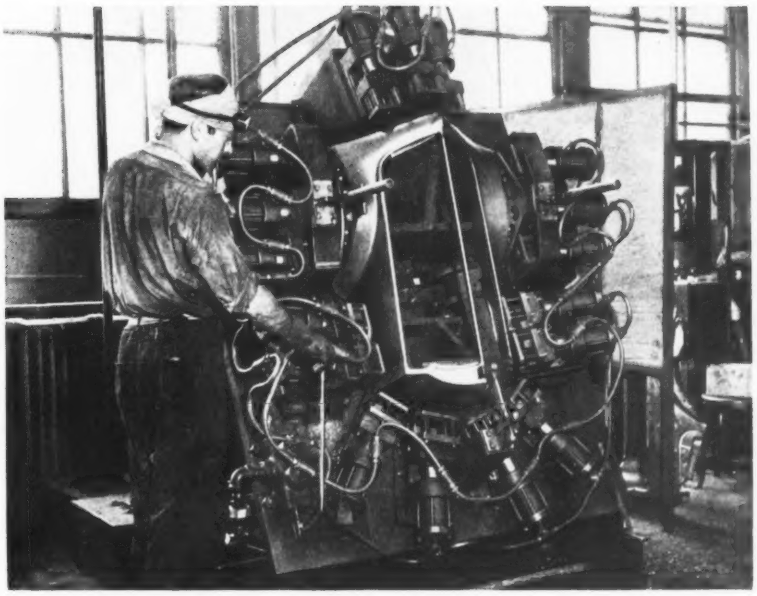


Fig. 1. Piercing Thirty-five Holes Simultaneously Around a Packard Radiator Shell by Equipment which Includes Nineteen Hydraulic Cylinders

THIRTY-FIVE holes are punched simultaneously in accurate relation to each other around the radiator shells for Packard automobiles by means of the equipment illustrated in Fig. 1. This machine consists essentially of nineteen hydraulic cylinders, mounted on a large steel plate. Some of the cylinders are used solely for clamping purposes, and the others for both clamping and forcing punches through the radiator shell.

In each case, the hydraulic head is fitted with a spring-backed pad, which is advanced to press the shell against inside blocks, bringing it to the shape that it will have when assembled. Then as the rams of the hydraulic cylinders complete their movements, the holes are pierced. The radiator shell is also clamped from the inside by advancing two slides sidewise after a shell has been loaded. Clamps are also brought down on the front of the shell at three points.

The pierced holes are necessary for attaching the radiator shell to the tie-rods, fenders, radiator core cradle, etc., and for lacing cord. Heretofore, it was necessary to punch most of these holes over size, so as to insure convenient assembly of the radiator shells to the automobile chassis. The present method of piercing all of the holes simultaneously insures a tight fitting radiator shell.

Fig. 2. Thirteen Holes are Punched at One Time in Packard Fenders to Accurate Center Distances

Machines based on the same principle are used for piercing the various holes in the fenders, such an operation being shown in Fig. 2. This machine is provided with ten hydraulic cylinders for punching thirteen holes in left-hand front fenders. An identical machine of opposite hand is used for right-hand front fenders.

* * *

The surfaces of new bearings, though carefully machined, ground, or reamed, are surprisingly rough and irregular. When first placed in service, they are usually operated at slow speeds, and when possible, under reduced loads. This minimizes the shearing action and attendant frictional heating that results when the oil-free high spots are abraded. This procedure is called "running in" and is carried on solely for the purpose of making the bearing surfaces smooth, by wearing down the high spots.

"Running in" by this method is a very tedious process. Unless care is exercised, bearings may, through overheating, develop improper clearances or possibly "burn out" completely. But just as surfaces may be made smooth by removing the high spots, so they may be made even by filling in the low ones. Colloidal graphite, when incorporated in the lubricant employed during the "running in" operation, is unusually effective in this connection, and is frequently used for this purpose.—*Technical Bulletin of the Acheson Oildag Co.*

Machining Schedule for Steel Hub

Sixteen Duplicate Parts are Economically Produced from a Bar of Steel in Eleven Operations by Using Simple, Carefully Planned Fixtures and Tool Equipment

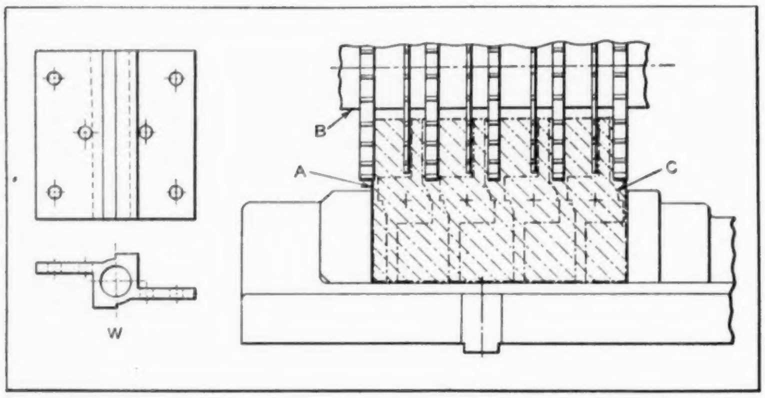


Fig. 1. One of Sixteen Pieces W Machined from Bar of Steel A Shown in Milling Fixture Used for First Operation

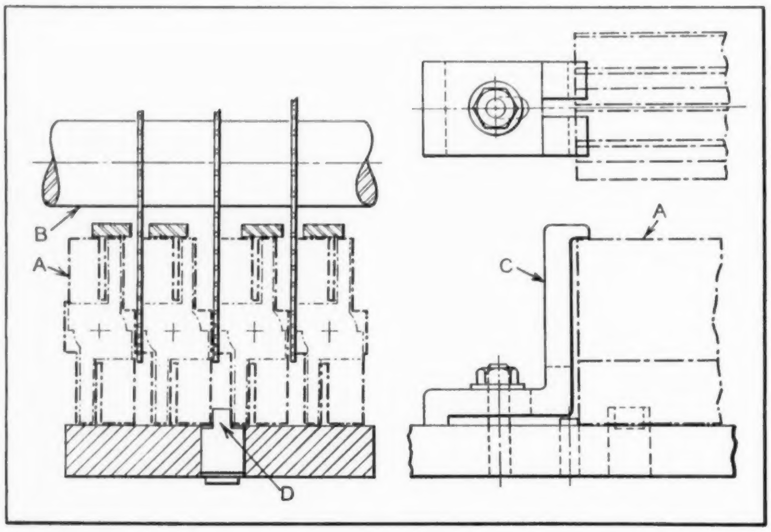


Fig. 2. Fixture and Set-up for Sawing Steel Bar into Four Parts

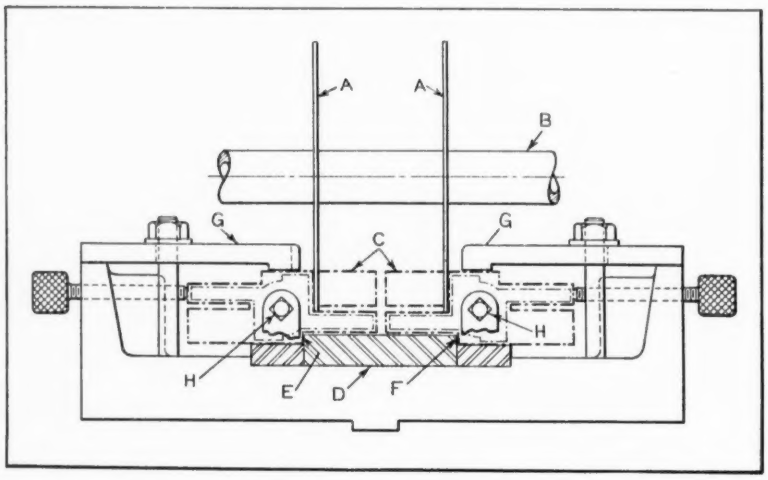


Fig. 3. Fixture and Milling Cutters Used in Removing Corner-sections from Bars

WHEN it is necessary or advantageous to machine duplicate parts from a solid piece of steel or bar stock, there is usually an opportunity to exercise considerable ingenuity in planning the machining operations and in designing the tools and fixtures required. To obtain the best results, each step in machining the work must be carefully planned with reference to the succeeding operations. How this was accomplished in the case of the tie hub *W*, Fig. 1, is shown in the accompanying illustrations, which cover the machining operations in their proper sequence from start to finish.

The eleven operations required in producing sixteen of these finished parts from one piece of steel are given in the accompanying table in the order in which they are performed. After the first two milling operations, the bar is sawed apart or split up into four bars, each of which, in turn, is sawed apart to form four pieces after Operations 4 and 5 have been performed.

The first milling operation is performed in the fixture shown to the right in Fig. 1. The bar *A*, which is 16 inches long with an allowance for cutting apart, is held in a vise while the gang of nine cutters on arbor *B* passes lengthwise through the bar. The dot-and-dash lines *C* indicate the finished outline of the work. The five wide cutters mill the three wide slots and trim the sides of the bar, while the four thin saws mill the narrow slots. Collars are employed in the usual manner for spacing the cutters on the arbor.

After the cutters pass through the work, the bar is turned over and the same cutters are used for similar cuts on the other side. These two operations leave the work gashed as indicated at *A*, Fig. 2. The simple milling fixture shown in Fig. 2 is next used for performing the third operation, which consists of cutting bar *A* into four pieces by taking

Planned for Efficient Production

By FRANK HARTLEY

three lengthwise cuts simultaneously, with the saws mounted on arbor *B*. Only one end of the fixture is shown, the opposite end being identical in construction and equipped with two clamps similar to the one shown at *C*. Two of these clamps are used at each end of the work. The work is located over pins *D* at each end of the fixture, which fit one of the previously milled slots.

The fourth operation consists of cutting out one corner-section of the separate bars, with the work held in the fixture shown in Fig. 3. The two saws *A*, mounted on arbor *B*, cut through the separate bars, thereby removing two corner-sections *C* which are used for other parts, thus effecting a saving in material. The center plate *D*, which runs lengthwise of the fixture, is used for locating the work against the shoulders *E* and *F*, the knurled-head screws being used to force the work against the shoulders. After locating the work in this manner, the clamps *G* are tightened. Endwise location of the work is obtained by screws *H* and stop-pins located at the opposite end of the fixture.

After milling out one corner of each bar, the work is turned over, end for end, for milling out the opposite corners in the fifth operation. The bar sections are now ready for cutting apart into individual units, after which they are machined all over.

Cutting apart in the sixth operation is accomplished as shown in Fig. 4. The work is mounted in the fixture and fed in the direction indicated by arrow *A*. The three cutters *C* pass through the work *D*, which is shown by dot-and-dash lines resting on two plates *E* and *F*. The work is set on these plates in such a position that its ends just overhang the plates. Four angular shaped clamps are used to hold the work. These clamps hold each individual part securely on the fixture while they are being cut off by the saws.

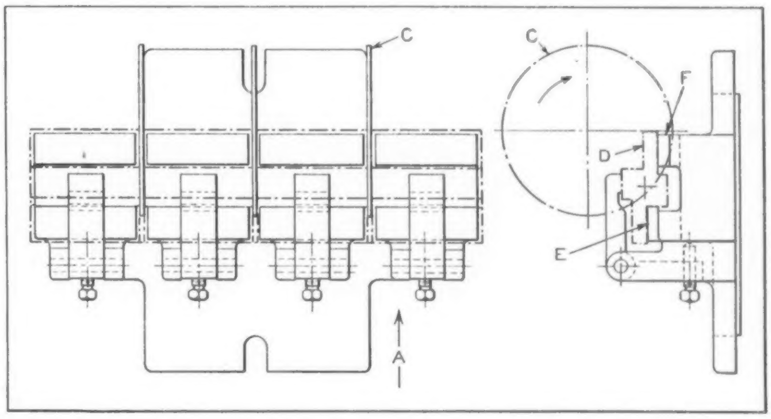


Fig. 4. Fixture Employed in Holding Milled Bar while it is being Cut into Four Parts by the Three Saws C

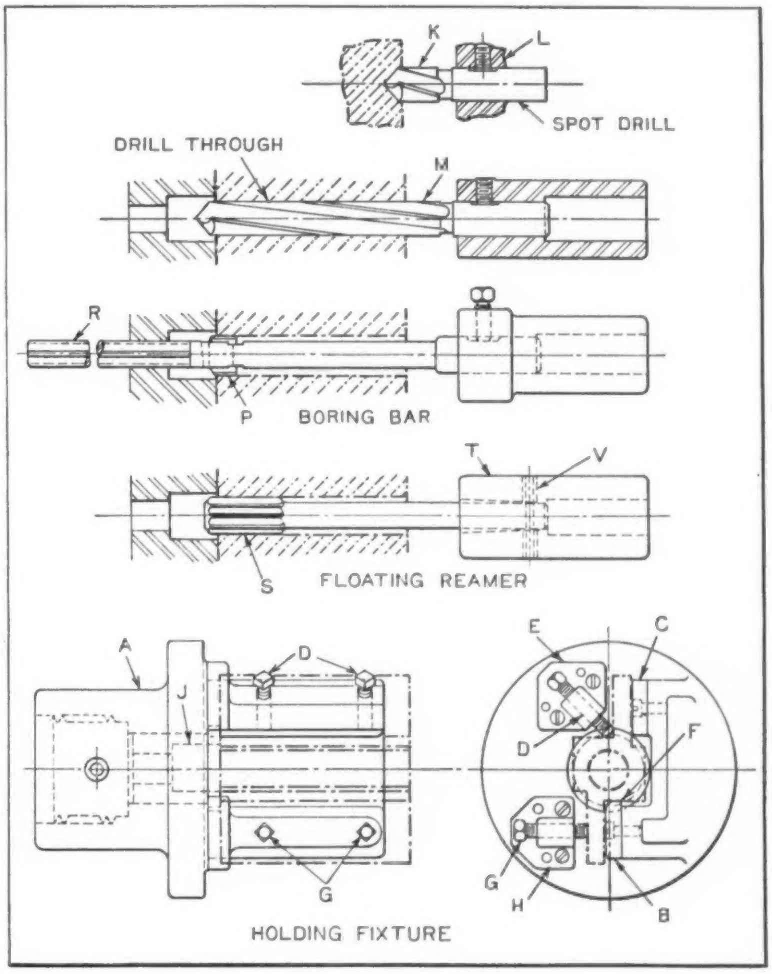


Fig. 5. Work-holding Fixture and Tools Used on Turret Lathe for Producing Accurate Center Hole in Part W, Fig. 1

The seventh operation consists of boring and reaming the center hole in the work. This is done in the manner indicated in Fig. 5. The fixture *A* is attached to the spindle nose of a turret lathe. The work is slid in place and rests against plates *B* and *C*. Two screws *D*, mounted diagonally in a block *E*, push the work against plate *B* at line *F*, while two screws *G* in block *H* operate in conjunction with these screws to hold the work securely. The end of the work is located against a bushing *J* mounted in the center of the fixture.

The work performed in this operation begins with the spot-drilling of the hole by drill *K*, which is held in a bushing *L* in the turret of the machine. A standard-length drill *M*, attached to the turret of the machine by a bushing, next drills a hole clear through the center of the work. This is followed by a boring cutter *P* which bores the hole concentric, the end *R* of the cutter-bar being guided in the bushing *J* of the fixture.

Following the boring operation, reamer *S* is used to machine the hole to size. This reamer is held in the bushing *T*, which is secured to the turret of the machine. The reamer is free to float, this action being obtained by means of the construction shown at *V*, which consists of a pin that floats in an enlarged hole, while the reamer itself floats in a bell-mouthed hole in the bushing. With an accurately finished hole now available in each piece for locating purposes, the work is ready for finish-milling first one side and then the other.

The first finish-milling cut (Operation 8) is taken with the work mounted on two studs *A* and *B*, Fig. 6, which locate the work from the center hole. The work at this time appears as shown by the dot-and-dash lines in the end view of the fixture shown to the left. A clamp *C* pivoting about stud *D* as a center is tightened by a screw *E*, clamping the work against the surface *F*. The work is thus held securely, so that a gang of four interlocking cutters *G* can mill the entire top surface of the work to the required shape and also finish one edge.

Operations Performed in Machining Sixteen Parts W, Fig. 1, from One Piece of Steel

Operation Number	Operation	Illustration of Fixture or Tool Used
1	Mill one side of bar	Fig. 1
2	Mill other side of bar	Fig. 1
3	Saw bars apart	Fig. 2
4	Cut one corner	Fig. 3
5	Cut opposite corner	Fig. 3
6	Saw to length	Fig. 4
7	Bore and ream hole	Fig. 5
8	Finish one side	Fig. 6
9	Finish opposite side	Fig. 6
10	Finish both ends	Fig. 7
11	Drill six holes	Fig. 8

The next, or ninth, operation consists of milling the opposite side of the work. The work is supported, for this operation, in the same manner as for the previous operation. Four cutters, also similar to those used in making the previous cut, are employed.

The work locating stud *A* of the fixture is supported in the bracket *P*, which is attached by means of screws and dowels to the base of the fixture. The locating stud *B* is mounted on a slide which is free to travel back and forth in a block *S* having a square slide and hold-down straps. A lever at *T*, through the medium of link *W*, operates the slide *R* back and forth by hand, so that the work can be readily put in place or removed. A hexagonal cap-screw *Y* is used to clamp this slide, after putting the work in place.

In operating the fixture, the screws *Y* and *E* are loosened and the slide *R* pulled to the right. After the milled piece has been removed and replaced with a new piece, the lever *T* is moved to the right, causing stud *B* to be pushed into the center hole in the work. The work is then clamped in place by tightening the screws *E* and *Y*. The block at *F* is made the right height to accommodate an unfinished surface, while a similar block is used in the ninth operation which is the correct height for locating the work from one of the surfaces that was finish-milled in the eighth operation, as previously described.

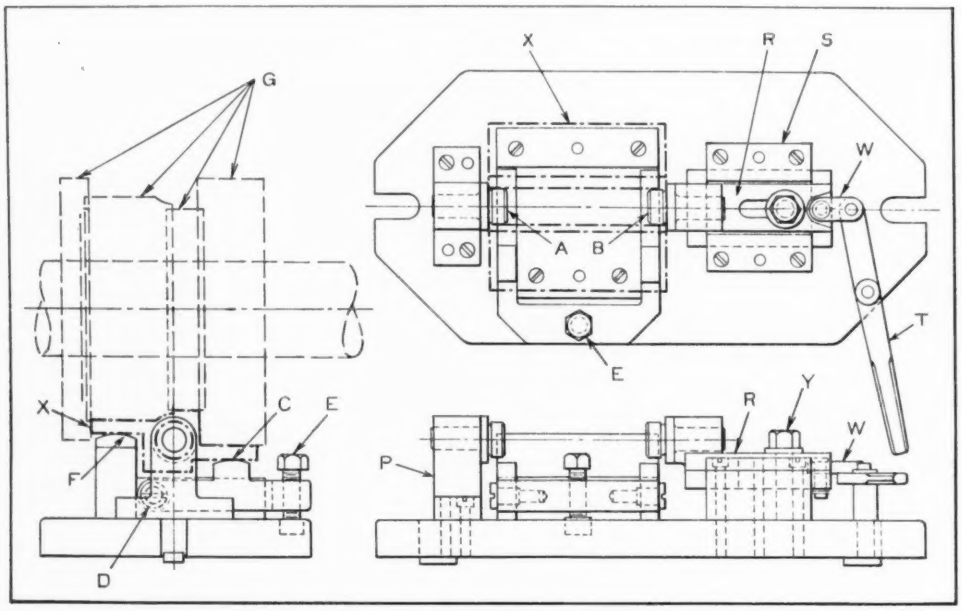


Fig. 6. Finish-milling Fixture Used for Final Operations on Two Sides of Work

In the tenth operation, two straddle milling cutters are used to mill both ends of the work simultaneously. The work *A* is held in the fixture shown in Fig. 7. The cutters are fed across the ends of the work in the direction indicated by arrow *C*. The method of locating and clamping the work is shown clearly by the illustration.

After completing the milling of the parts by splitting the bar stock into four shaped bars and again dividing these bars into four individual units, the work is completed by drilling three holes through each side of the pieces. The jig shown in Fig. 8 is employed for the drilling operation. This jig is of the built-up type having two lengthwise connecting pieces *C* and *D*. Piece *C* carries three bushings *E* for guiding the drills through the work *X*, which is drilled one side at a time. The work is placed over the stud *F* while an arbor *H* is slid into the hole in the opposite end of the work. Arbor *H* can be moved back and forth by means of the pin *J*. The screw *K* has a formed end which fits into the cam groove *L* in arbor *H*. This arrangement acts as a bayonet type lock which permits the arbor to be quickly advanced to or removed from the hole in the work, and at the same time, allows the arbor to be locked in place against the end of the work by revolving the arbor by means of pin *J*.

The side plate *C*, which carries the bushings, is so proportioned that the work rests against it squarely. This arrangement provides for locating the work radially in conjunction with the two flattened pins *M*. After drilling one side of the work, the piece is removed and turned over in the jig to permit drilling the three holes in the other side.

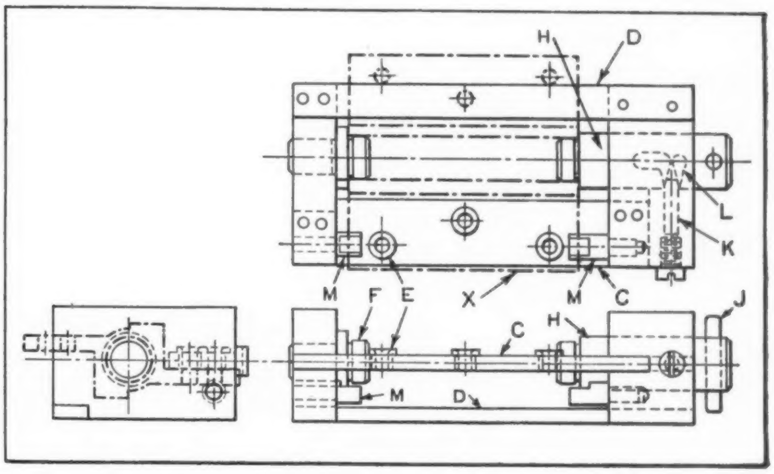


Fig. 8. Jig Employed for Drilling Piece W, Fig. 1, in Two Settings

* * *

Importance of Cutting Lubricants

Today one finds that the majority of metalworking plants are using sulphur-base oils of various types with extremely satisfactory results on such operations as threading, milling, reaming, etc., while a soluble oil mixed with twenty to thirty parts of water is used for the ordinary run of production turning jobs, etc. In a great many cases, the life of cutting tools or the finish obtained on the work can be improved through the use of the proper type of cutting oils, not forgetting that the proper flow of oil is of importance, as well as the type of cutting fluid used. Should you be experiencing machining troubles in your plant, do not blame the material being fabricated or the cutting tools until you have made certain that the cutting oil employed is of satisfactory composition.—*A. H. d'Arcambal, Pratt & Whitney Co., before the American Society of Tool Engineers*

* * *

Large-volume production is so organized that it cannot profitably serve only a few. It must always serve a great number of people. Large-volume industry must always try for improved products at still lower cost, so that a constantly increasing number of people can afford to buy its products.—*Charles R. Hook, president, American Rolling Mill Co.*

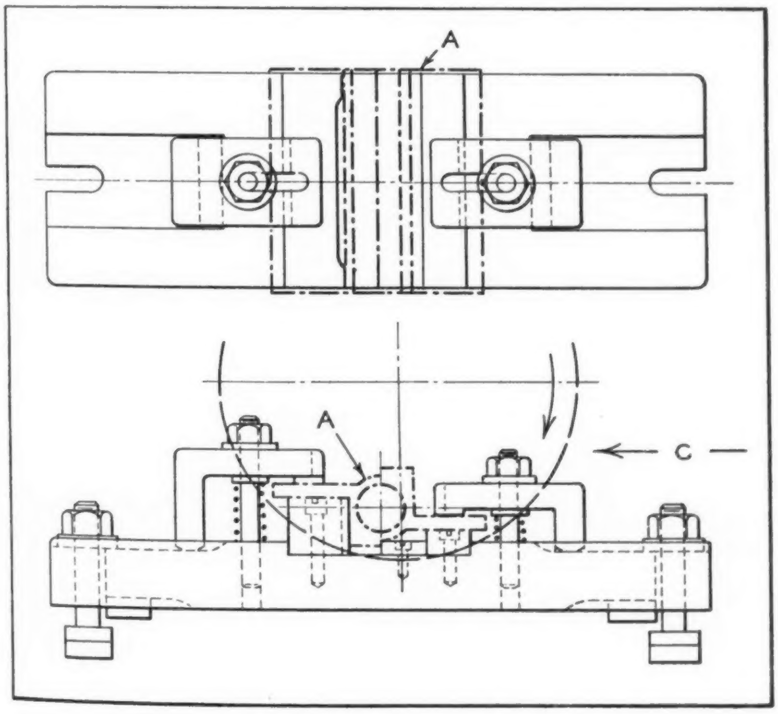


Fig. 7. Straddle Milling Fixture Used to Finish Two Ends of Work Simultaneously

Engineering News Flashes

The World Over

Stone Crushers Assume Giant Proportions

A stone crusher has recently been completed by Hadfields, Ltd., Sheffield, England, which is another example of the huge proportions of modern machine equipment. This stone crusher weighs over 100 tons and has a capacity for crushing from 300 to 350 tons of stone an hour. Its total length is over 20 feet, and its feed opening, measuring 4 by 5 feet, enables it to handle the largest pieces of rock likely to be picked up by a mechanical shovel. It will be used for crushing hard limestone and has, in fact, crushed a 4 1/2-ton block into fragments in 75 seconds.

General Electric Develops "Heat Gun"

What is known as an "electric heat gun," combining an efficient electric heater and a hand vacuum cleaner, intended primarily for service-station and garage use, but suitable also for various industrial maintenance applications, has been developed by the General Electric Co. at its Bridgeport, Conn., plant. The heater unit of the device is attached to the exhaust orifice of the vacuum cleaner, and the combination provides a large volume of warm air for thawing out transmissions, differentials, carburetors, radiators, etc., and for drying wet ignition systems. A 20-foot all-rubber cord permits the device to be used within a large working radius.

Chromium-Plating Diesel Engine Cylinder Bores

The remarkable wear-resistant properties of a hard chromium-plated surface are well known, and the use of chromium-plated wearing surfaces on gages, certain types of cutting tools, and press tools has been frequently referred to in the technical press. This being so, it is not surprising that the possibility of chromium-plating the cylinder bores of internal-combustion engines has attracted attention, particularly since chromium, in addition to its abrasive wear resistance, is highly resistant to corrosion. It has been recognized, of course, that the difficulties of getting a chromium deposit to adhere to a cylinder bore are very great, because of the temperature variations encountered in service.

From Great Britain we learn, however, that a well-known Diesel engine manufacturer in that country, working on the basis of a Dutch invention, has succeeded in developing a satisfactory process for chromium-plating cylinder bores. We are told that tests on engines with the cylinders thus treated have shown satisfactory results. Thus, in a stationary Diesel engine running under normal conditions, it has been found that the amount of wear in a given period of the chromium-plated cylinder is only about one-third that of the best material previously used for the cylinders. The success with Diesel engines has suggested the possibility of such treatment for automobile and truck engine cylinders.

Rapid Advance in Air-Conditioning of Railroad Cars

The rapidity with which the railroads have provided air-conditioned passenger cars is best indicated by the fact that on November 30, there were 7846 air-conditioned passenger cars on the railroads in the United States, an increase of about 1700 in the last six months.

Better Lighting for Storage Bins

With a view to concentrating light on the vertical and horizontal surfaces of storage bins and stock racks, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has brought out what is known as a "luminaire," which consists of a reflector, socket cover and socket, and suitable lamp. The reflector is designed to direct more light to the bin, while at the same time shielding the eyes and cutting off the light from the aisle between the bins.

Camera Aids in Examining Belting

An investigation into the gripping power of leather belting has been carried on by the Schieren Co., belting manufacturer, New York City. In this investigation, use has been made of a Contax camera with an extension tube for taking photographs

of the belt under tension. A glass cylinder was substituted for the pulley on which the belt would run in normal operation. In this way, the extension tube of the Contax camera could come as close as possible to the under side of the belt, taking flash photographs through one thickness of glass. The photographs revealed that, under tension, the pores of the leather, normally deep and close together, become shallower and farther apart, and the areas between the pores are forced up against the pulley, gripping it like a vacuum cup.

Rubber Tires on Railroad Cars

According to a recent number of *Engineering* (London), the London, Midland and Scottish Railway has introduced rubber-tired cars in passenger carrying service between Rugby, Leamington Spa, and Coventry. The cars are built by the Coventry Pneumatic Railcar Co. of Coventry, England.

Will the Polar Winds Some Day be Used for Generating Power?

A British scientist, Mr. Debenham, has called attention to the Antarctic air currents which are so steady and persistent that they have been called "air rivers." It is entirely conceivable, he says, that in the remote future, when coal and oil resources have been practically exhausted and all available water power utilized, these great air streams may be harnessed. In the little-known Adelie Land, a current of air at least 50 miles wide and probably thousands of feet deep moves almost constantly at an average speed of 50 miles an hour. It has been suggested that this air current has as much potential power as the falls of Niagara.

Canada Produces Most of World's Nickel

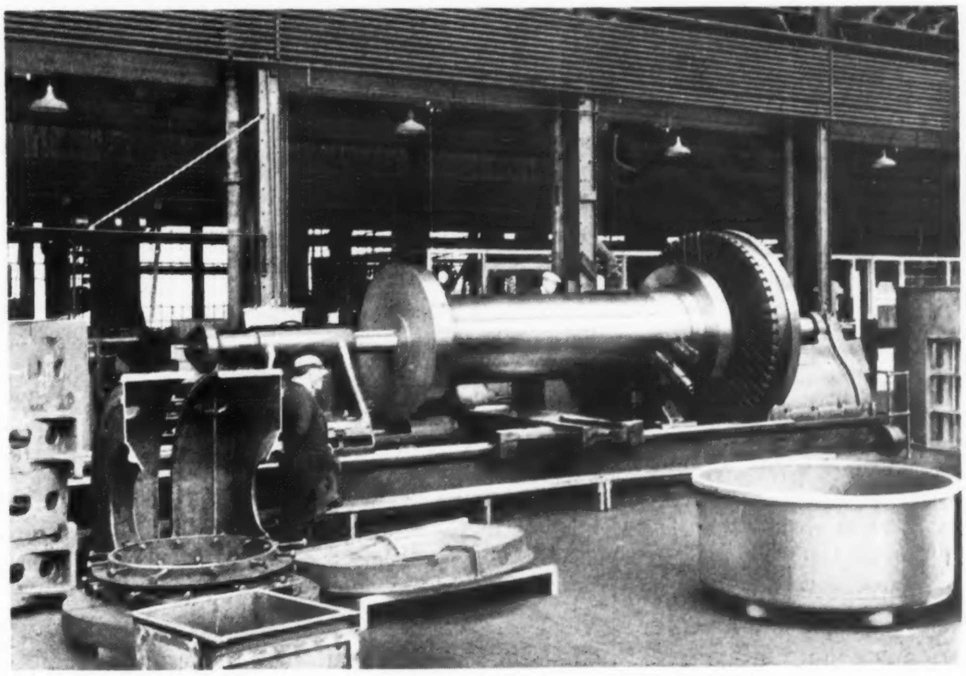
Canada now produces 90 per cent of the world's nickel, and has been the leading producer of this metal since 1905, when it took the lead from New Caledonia. Before that, New Caledonia was the largest producer from 1880 to 1905, except for three years. Norway was the leader for twenty-five years, until New Caledonian mining began in 1875. In 1935, the world used 160 times as much nickel as was produced in 1875.

Making Shop Floors Oil-, Grease-, and Dust-Proof

A liquid that produces non-dusting cement floors which do not stain and are oil- and grease-proof has been developed by the Truscon Laboratories, Detroit, Mich., under the trade name "Granitex." This is not a chemical floor hardener, and is not to be confused with sodium silicate or other chemical treatments. Granitex hardens concrete floors by introducing into the pores a binder or tough wear-resisting filler. It is applied simply with a long-handled brush, in much the same manner as a floor is mopped.

Molds for Casting Precious Metals

In casting gold and silver, temperatures around 1600 degrees F. are used. These temperatures create a considerable problem in materials for the mold boxes, as most metals oxidize at such great heats. Recently Inconel, an alloy of nickel and chromium, has been chosen as the material for these boxes, because it resists destructive oxidation up to 1950 degrees F.



Machining a section of a shaft for one of four Boulder Dam turbines at the Allis-Chalmers plant in Milwaukee. These turbines are the largest and most powerful ever built, developing 150,000 horsepower when the water in the reservoir reaches its maximum head of 592 feet. Through each turbine will pass 270,000,000 gallons of water daily, three times the daily water consumption of a city the size of Milwaukee. Sixty railway cars are required to ship the four units

EDITORIAL COMMENT

Increased Costs Can be Met Only by Improved Methods and Machines

Increased manufacturing costs are ahead. Of that there is little doubt. Increased taxes will take a large share of the income of industry. Other expenses are likely to increase rather than decrease.

There is only one way in which manufacturing costs can be reduced—by the use of improved methods and more highly efficient equipment. The entire problem as it faces the manufacturing industries is tersely stated in a recent bulletin published by the Curtis Pneumatic Machinery Co. "In the past," says this bulletin, "cost reducing equipment has been bought and installed principally to increase profits. Today, cost reducing equipment must be installed in many cases *in order to stay in business*. Therefore, cost reduction under present conditions is not merely desirable, but necessary—even imperative. This can be accomplished in three ways: (1) By superseding costly hand labor and hand equipment with modern power handling devices; (2) by replacing inefficient, worn-out, and overloaded equipment; (3) by making the best use of facilities already available."

While there are many retrogressive forces active in our national life at the present time, industry will continue to do its share in improving manufacturing facilities, reducing costs, and making available to a constantly greater number of people the products of industry which increase the comforts of life and assure general well being.

How Advertising Helps to Create More Employment

If one of the men recently hired by, let us say, the Amalgamated Machine Products Co. were told that he had the company's advertising to thank for getting the job, he probably would find it hard to believe that statement. Yet it would be a fact. If it had not been for the success of the company's recent advertising, no more men would have been needed in its shop.

The relation between a rising volume of production and a larger working force is obvious. The connection between larger production and increased sales is equally apparent. But it is not so generally recognized by the men working in the shop that sales do not increase by mere chance. Any steady growth in sales is the direct result of a steady sales promotion effort, in which advertising usually plays a leading role. Instead of giving so much attention to the popular clamor about unemployment and its causes, it would be well if some consideration were given to the things from which employment springs. If this were done, advertising would be recognized as one of the forces directly responsible for creating a steadily increasing number of jobs.

Opportunities for Young Men in the Mechanical Field

The number of skilled men in the mechanical industries has steadily declined during the last decade. To make up for this, highly improved machines have been designed and methods and practices have been standardized. In this way only can industry continue to function efficiently.

Definite efforts must be made by industry to provide for such trade training as will at least maintain the present number of skilled men in industry. Gradually the number must be increased to take care of new industries and a constantly increasing business.

One frequently hears it said that the young men of today will not learn a trade—that they are looking for white-collar jobs. In communities where an organized effort to interest young men in trade training has been systematically directed and persistently applied, this statement has been found to be erroneous. Some well-known plants have waiting lists of young men anxious to learn a trade.

To the capable boy, the machinery industries hold out the opportunity not only of becoming a skilled mechanic, but also of gradually rising to an important position in industry. Some time ago, a large plant employing several thousand men, reported that out of the nineteen highest mechanical positions in the plant, seventeen—including the position of works manager—were filled by men who had learned their trade as apprentices in the very plant in which they now held important positions. Wherever such opportunities for advancement can be definitely pointed out to young men, there will be no difficulty in securing capable and ambitious boys for the apprentice training courses.

Radius Planing Attachments

RADIUS planing is not generally resorted to if the work can be machined by form milling or by turning in a lathe or a large boring machine. On the latter type of equipment, it is often convenient to machine two or more parts at a time by mounting them in a circular formation or by making the parts form one large circular piece which can be split or parted, as required, after the turning or boring operations have been performed. There are times, however, when it is necessary to use a planer for machining curved surfaces. The accompanying illustrations show various planer attachments for use in such cases.

A comparatively inexpensive radius planing set-up that requires very few parts is shown in Fig. 1. The upper ends of the two tool-slides are coupled together by a link or bar. This bar has holes at each end which fit pins set in the tool-slides. The clamping bolts of the swivel slide at the left are loosened just enough to permit the slide to be rotated. Thus, when the tool-slide to the right is fed along the cross-slide as indicated by arrow *F*, the tool in the swiveling slide to the left rotates in a clockwise direction, so that it cuts along the radius-formed surface indicated by the dot-and-dash lines.

For planing curved surfaces of large radii or irregular surfaces, a former plate attachment (see Fig. 4) may be used. The same former plate can be used for planing both concave and convex parts by reversing its position. The roller which travels in the curved slot of the former plate is carried on a pin fixed to the tool-slide. The regular down-feed screw is removed to allow the tool to follow the curvature of the slot in the former plate when it is traversed across the work. The former plate may be split at the ends of the slot to provide for taking up wear in the slot and to facilitate machining. A weight may be employed, as shown, to keep the roller in contact with the lower surface of the slot in the former plate.

The arrangement shown in Fig. 2 is suitable only for concave surfaces of small radii. With this set-up, the radial movement of the tool is obtained by rotating the clapper-box or tool-box. The clapper-box is of special design having worm-wheel teeth cut in the clamping flange. The worm which engages the worm-wheel is driven by shafts and universal couplings from the power feed at the end of the cross-slide, as shown. Hand feed can also be applied at this point. The radius of the surface machined is equal to the distance from the point of the tool to the center of the pin about which the clapper-box rotates.

In Fig. 5 is shown a convex planing attachment.

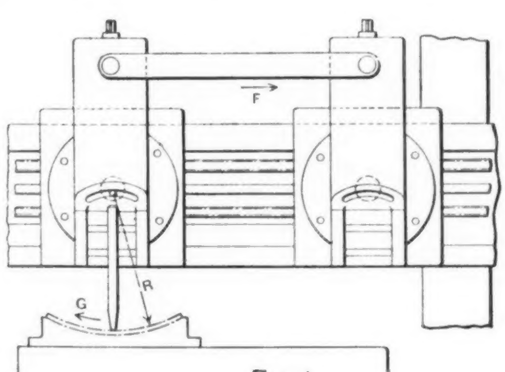


FIG. 1

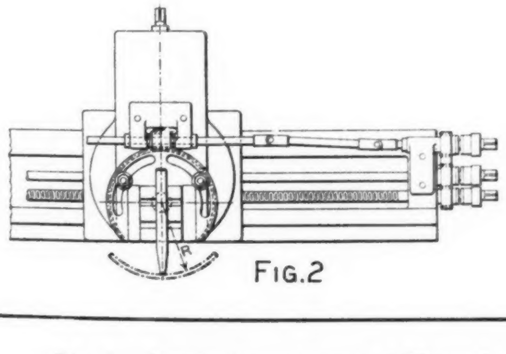


FIG. 2

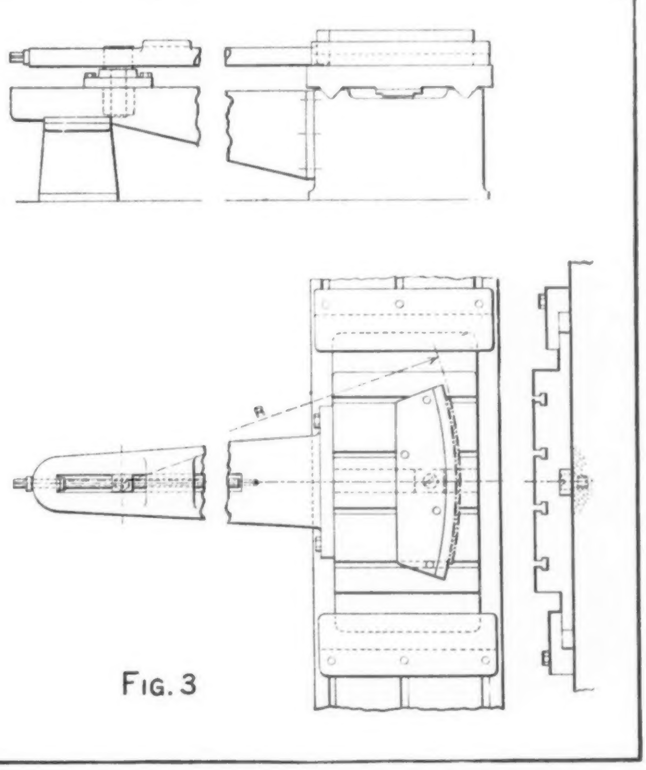


FIG. 3

Fig. 1. Simple Arrangement of Planer for Radius Work. Fig. 2. Rotating Clapper-box for Planing Concave Surfaces of Small Radii. Fig. 3. Radial Table Type Planing Attachment

With this attachment, the feed-screw is removed from the tool-slide and a bracket is fixed to the top of the slide which carries a pivot pin for the top end of the radius-bar. The bracket fixed to the cross-slide carries the pivot for the lower end of the bar. The radius-bar was originally made in one piece and offset, as shown by the dotted lines in the end view, but it is now made in two parts so that the center distance can be adjusted to cover a fair range of radii. It will be noted that vertical adjustment of the tool independent of the radius-bar can only be made by raising or lowering the cross-slide or moving the tool in its holder.

Fig. 6 shows fixtures for carrying cylindrical work having projections on the outside which prevent the radial surfaces from being machined by turning. The two headstocks are mounted on the planer table and are each provided with chucks or faceplates suitable for the work to be machined, the work being mounted between the two, as indicated by the dotted cross-sections. On the rear end of the spindle in the headstock to the left, there is mounted a worm-wheel which is engaged by a worm. The end of the worm-shaft is squared to receive a handle, so that the work can be fed around as required at the end of each stroke. If desired, a ratchet wheel and pawl for automatic feeding can be provided, and the necessary actuating gearing can be attached to the planer.

Fig. 7 shows a concave planing attachment of the radius-bar type arranged so that the vertical feed can be applied to the tool-slide without interfering with the radius. The radius-bar, which can have holes for various radii, is secured to the tool-slide by a pin at its lower end, the upper end being pivoted on the combined nut and pin carried in the slide support on the two cross-beams which are bolted to the uprights of the machine. Vertical feed can be applied by means of a feed-screw which actuates the combined nut and pin, connected to the upper end of the radius-bar. When the feed is not being used, the nut can be locked in position. With this attachment, the vertical screw in the regular feed-slide is, of course, removed. Radius *R* is always equal to the center distance between the holes used in the radius-bar. The tool is traversed in the usual way.

Fig. 8 illustrates an attachment employing a special table mounted on the main table of the planer. The auxiliary table is carried on an adapter plate which, with its hold-down plates, is bolted to the main table. The table is arranged to slide on the adapter plate at right angles to the main table and has a narrow guide which is attached to the radius-bar by means of a swivel joint. The outer end of the radius-bar is gripped in a pivot block supported by a housing. This housing is carried on an arm bolted to the planer bed at one end and

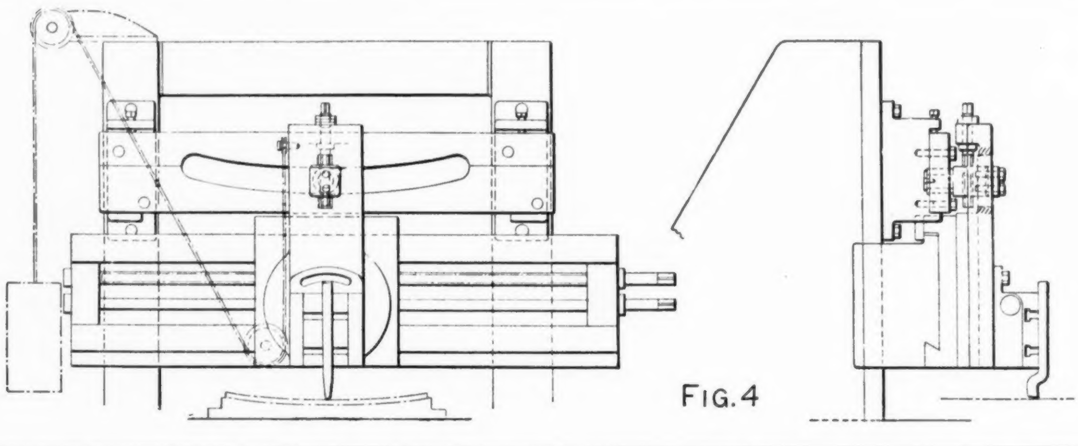


FIG.4

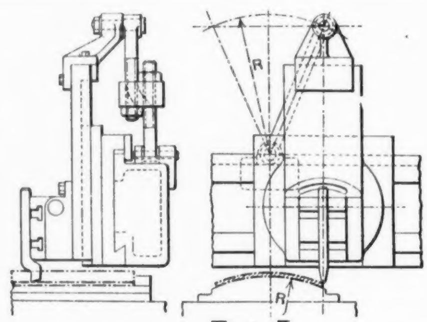


FIG.5

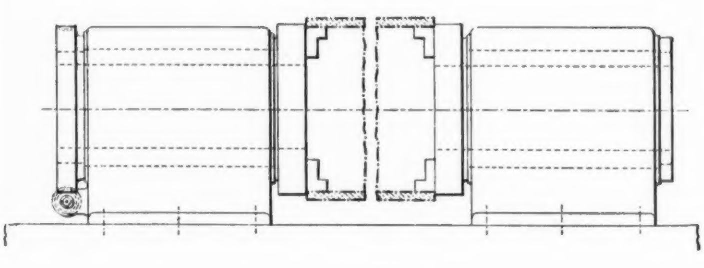


FIG.6

Fig. 4. Planer with Former Plate Attachment for Machining Curved Surfaces of Large Radii or Irregular Surfaces. Fig. 5. Convex Planing Attachment with Radius-bar. Fig. 6. Fixture for Planing Cylindrical Work

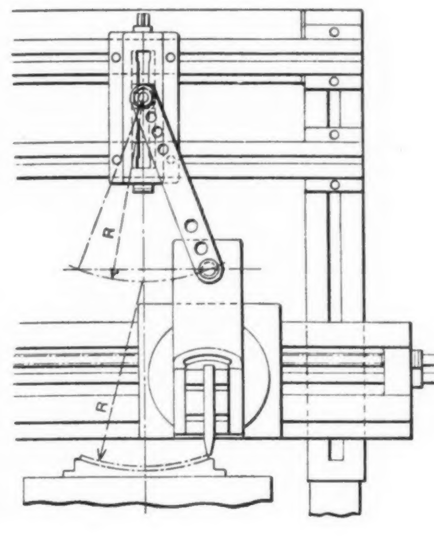


FIG. 7

Fig. 7. Concave Planing Attachment Using Radius-bar

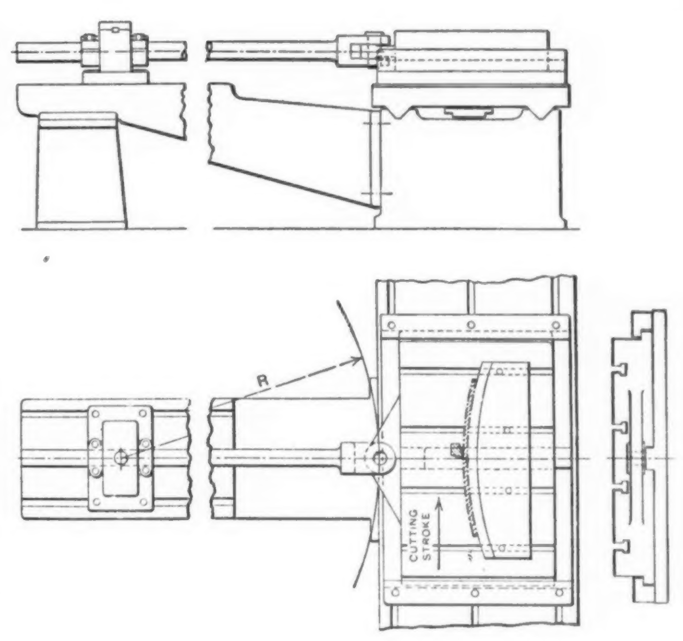


FIG. 8

Fig. 8. Oscillating Table Type Radius Planing Attachment

supported from the floor by a column at the other end. The arm has T-slots in its top face for setting the pivot-block housing to suit any radius.

The radius machined is always equal to the center distance R between the swivel pin and the pivot pin of the radius-bar. In operation, the main table of the planer is run in the usual way, the radius-bar causing the auxiliary table to oscillate across the main table and so reproduce the radius R on the work shown in dotted cross-section. A pointer that indicates when the radius-bar is exactly at right angles to the table facilitates setting up the work. One disadvantage of this attachment, particularly on work of small radius, is the necessity for a large side clearance on the cutting tool.

It should be noted that the work does not move radially past the tool, but always at right angles to the longitudinal movement of the planer bed. It is at the end of this cutting stroke that the extra side clearance is required, while at the beginning of the stroke the side clearance is excessive. This attachment, and also that shown in Fig. 3, are more easily adaptable to open-side planers.

On the standard planer with two uprights, care must be taken to see that the swinging radius-bar does not interfere with the adjacent upright. The center line through the pivot bearing of the radius-bar at right angles to the machine table should be in line with the cutting edge of the tool. The arm that supports the radius-bar must therefore be located the proper distance from the uprights. An extension head can be fitted to the tool-slide, in order to permit the attachment to be brought farther away from the planer uprights.

The attachment shown in Fig. 3 is similar to the one shown in Fig. 8, except that the work is moved radially past the tool. This feature offsets the trouble from interference with the side clearance of the tool, and also gives a better cutting action. With this equipment, the work is also mounted on an auxiliary table secured to the main table by hold-down plates. The drive is transmitted from the main to the auxiliary table by a pin in a block which is a sliding fit in a slot in the auxiliary table.

The radius arm is rigidly bolted to the auxiliary table and is pivoted on a pin supported in the bracket attached to the machine base. The head of the pivoting pin for the radius arm is used as an adjusting nut and slides in a slot in the radius arm, so that fine adjustment can be obtained in setting the fixture to machine the required radius. The pivot supporting bracket can also be adjusted along the supporting arm to suit different radii. It will be noted that a good clearance is provided between the ends of the auxiliary table and the hold-down clamps. This is necessary in order to have the corners of the auxiliary table clear the hold-down clamps near the end of the stroke.

In the case of attachments such as shown in Figs. 1, 4, 5, and 7, it is sometimes desirable to provide means for obtaining down-feed adjustment of the tool. This can be done by fitting a small tool-holder and feed-slide to the machine tool-box. For example, the swivel slide and tool-holder from the compound rest of a small lathe may be used for this purpose. Another method is to remove the existing clapper-box and tool-holder and fit a down-feed slide and tool-holder in their place.

Interviewing the Tool Supervisor

The Practices of Two Well-Known Plants in the Use of Cutting Tools, as Recorded in the Interviews Here Published, Bring Out Present Tendencies in the Most Advanced Use of Tool Materials

Q. WHAT materials do you use for cutting tools in your shop?

A.—The standard grade of high-speed steel, cobalt high-speed steel, Stellite, and cemented carbides.

Q.—What is the approximate percentage of the number of tools used that are made from each of these materials?

A.—Slightly more than 25 per cent are made from standard high-speed steel. Almost exactly 25 per cent are made from cobalt high-speed steel. The remaining tools—somewhat less than 50 per cent—are divided between Stellite and cemented carbides, the cemented carbides being used to by far the greatest extent.

Q.—When are the regular old type carbon tool steels used for cutting operations? Do you use carbon tool steel drills in the smaller sizes?

A.—Carbon tool steels are used mainly for threading dies and small drills. Dies used for threading brass, copper, and the softer alloys are always made from carbon tool steel. For threading steel, cast iron, and other materials that have a high abrasive action, we use high-speed steel. Carbon steel is used for drills in the wire-drill sizes.

Q.—Is it likely that the high-speed steels will be replaced still further by the newer materials, or have we about reached a balance?

A.—At the present time more than 50 per cent of the tools used in our shops are made from various grades of high-speed steel. I do not believe that high-speed steel tools will be entirely replaced by the newer carbide tools in the near future, because the manufacturers of high-speed steel are constantly developing new and better steels. On the other hand, of course, we are finding new applications for the carbide tools. I believe, however, that by closer supervision of all cutting tool applications, it will be possible to get much more out of high-speed steel tools than has been done in the past.

Q.—When and where do you use the cobalt high-speed steels?

A.—Some low-cobalt high-speed steels are used in tool bit sizes 3/8-inch square up to 3/4-inch square. This steel contains from 4 to 5 per cent cobalt, and is used for light roughing and finishing cuts. These tools will cut at a higher temperature and hold their edge for a longer period than the standard high-speed steels. We also use some high-cobalt steel with from 8 to 12 per cent cobalt for the same sizes of tool bits. These tools are used especially for roughing, where a high red-hardness is required. They will give better service if they are not pressed too hard until the temperature of the tool is raised to a high degree by the cutting action. In other words, these tools cut much better at a high temperature than they do at lower temperatures.

Q.—For what operations and for what metals do you use Stellite?

A.—We use Stellite on roughing operations on cast iron where the tools are subjected to great shock and where it is impossible, because of the design of the part being machined, to give tungsten-carbide tools proper support.

Q.—What are the chief advantages of the carbide tools—high cutting speed, long life of tool between grinds, or fine finish on the work?

A.—The chief advantage of carbide tools is the combination of higher cutting speed with less frequent grinding, making it possible to produce a greater number of pieces at reduced cost. On some heavy roughing work it has been found most economical to rough the work at the same speed as for high-speed steel tools, the advantage gained being a much longer life between grinds.

Q.—For what type of operations mainly do you use cemented-carbide tools?

A.—Ordinary lathe and boring mill tools account for probably 60 per cent of our carbide tools; milling cutter blades, 10 per cent; saws, 2 per cent; counterbores, reamers, spot-facers, etc., 2 per cent; and drills, 1 per cent. The remaining 25 per cent is accounted for by non-cutting, wear-resistant tools and parts used in connection with shop operations.

Q.—On what materials have you used cemented-carbide tools successfully?

A.—We are using carbide tools successfully on practically all materials encountered in our shops —steel, cast iron, brass, bronze, aluminum, mica, babbitt, and synthetic plastic materials.

Q.—How do the cutting speeds of the various cutting tool materials compare, approximately?

A.—This question would require quite a tabulation, since the cutting speeds vary for different types of material being cut. As an example, however, let us assume an electric furnace cast gray

iron, in regular production. This iron has a tensile strength of 40,000 pounds per square inch and a Brinell hardness of from 180 to 200. If we were taking a 3/16-inch depth of cut, with a feed of 0.025 inch, the most economical cutting speed for the standard high-speed steel would be 60 feet per minute; for 8 per cent cobalt steel, 100 feet per minute; for J Stellite, 125 feet per minute; and for Carboloy, 225 feet per minute.

Q.—What are the average cutting speeds that you use with cemented-carbide tools?

A.—For roughing cast iron, 150 feet per minute; for finishing cast iron, 200 feet; for roughing soft steel, 100 feet; for roughing hard steel, 60 feet. We do not generally use cemented-carbide tools for finishing steel. For roughing brass and bronze, we would use about 200 feet per minute, and for finishing, 300 feet.

Q.—What feeds would you use for cemented-carbide tools?

A.—For roughing cast iron, from 0.06 to 0.12 inch; for finishing cast iron, 0.006 to 0.010 inch; for roughing soft steel, 0.06 inch; for roughing hard steel, 0.03 inch. For brass and bronze, the same feeds as for cast iron are applicable.

Q.—What would be the maximum depth of cut that you use with cemented-carbide tools?

A.—It is rather difficult to define the maximum depth of cut, but generally speaking, I would say that it would be advisable not to exceed these figures: For roughing cast iron, 3/16 inch; for finishing cast iron, 1/64 inch; for roughing soft steel, 1/2 inch; for roughing hard steel, 1/4 inch. For brass and bronze the same figures as for cast iron would apply.

Q.—What is the average increase in production that can be obtained by the use of cemented-carbide tools?

A.—Here, again, the material being cut is of importance. On cast iron and non-ferrous material, it is possible to obtain an increase of from 100 to 200 per cent, and on steel, 50 per cent. Giving due consideration to the increased cost of the tools, the actual saving in machining costs would be about 50 per cent for cast iron and 25 per cent for steel; while on non-ferrous materials, as well as on non-metallic materials, the savings would run anywhere from 50 to 100 per cent.

This ends the first interview. The conversation with the tool supervisor in the second plant follows.

Q.—What are the approximate percentages of the tools used in your plant made from different cutting tool materials?

A.—In making a comparison of the use of different cutting-tool materials, it is difficult to state the exact percentages of tools that have been made from each type of cutting material during a certain period. It is easier to give percentages of the amount of money expended for different cutting-tool materials. From these figures, the extent to which each one of the materials is actually being used in cutting operations may be determined. In our plant, 56 per cent of the tool material outlay was spent in 1935 for high-speed steel, 31 per cent for Stellite J-metal, and 12 per cent for cemented carbide. The remaining 1 per cent was divided between cobalt high-speed steels and carbon tool steels. These figures do not include cutting tools which were purchased already fabricated from outside firms, but simply material for tools fabricated within the plant.

Q.—When and where do you use cemented-carbide tools?

A.—The cemented-carbide tools are used almost exclusively on cast iron. They have not been used in this plant to any great extent on steel or non-ferrous materials. On mass production work, where the amount of stock on castings is held to a minimum, as, for example, in tractor manufacture, tungsten carbide finds its greatest use. For high cutting speeds, these tools obviously hold first place. Their long life and the elimination of frequent grindings are factors of prime importance.

Q.—When and where do you use Stellite?

A.—In the last few years, Stellite J-metal has become widely used. This material is used extensively in machining cast iron and occasionally for steel. J-metal finds its particular application where high speeds and feeds are required and where considerable shock is encountered as well.

Q.—When and where do you use cobalt high-speed steel?

A.—Twelve per cent cobalt high-speed steel is used on automatic machines for machining steel.

Q.—Besides the standard high-speed steels, what other steels do you use?

A.—For the great mass of machining operations, the choice naturally goes to the standard grades of high-speed steel. For fine finish on any kind of work, the low-tungsten steels are preferred. For corrugating chilled rolls for flour mills, carbon tool steel containing 3 per cent tungsten is used. This low-tungsten steel is also used for finishing hollow-bored holes in long shafts, where a fine finish is required.

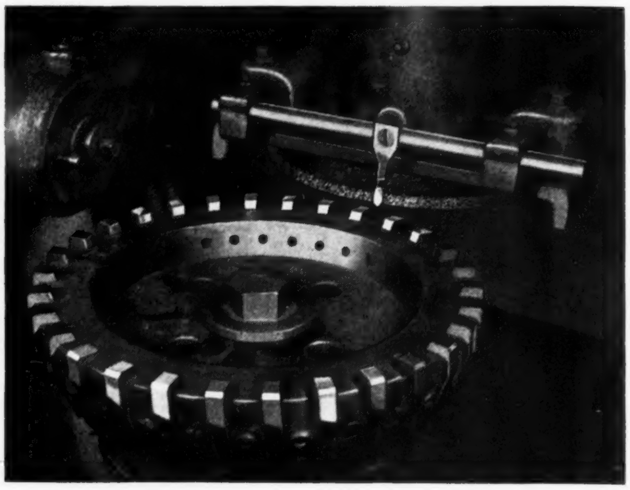
* * *

Hacksaw Blade Standardization

The Division of Simplified Practice of the Bureau of Standards, Washington, D. C., has announced that printed copies of Simplified Practice Recommendation R90-36 on hacksaw blades are now available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each. This recommendation became effective October 1, 1936, and covers the length, width, thickness, and number of teeth per inch of carbon steel and high-speed steel blades used for hand and power hacksaws. It constitutes a revision of the original recommendation which became effective July 1, 1929.

Present-Day Practice in Hard-Facing with Haynes Stellite

The Hard-Facing Process has Come into More and More General Use During Recent Years. The Present Article Reviews the Best Present Practice

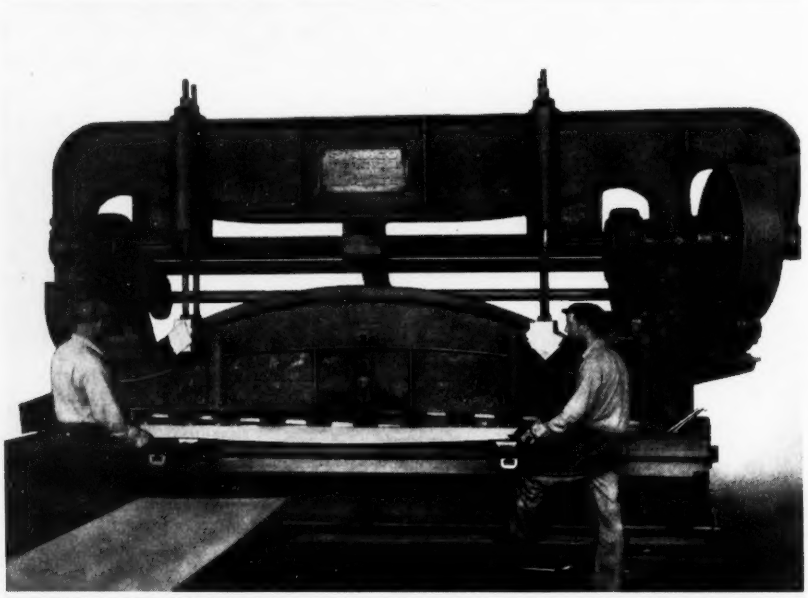


By Hard-facing the Indexing Finger on a Cutter Grinder, the Life of the Finger was Increased from Ten to Twelve Times

HARD-FACING is the process of welding to parts subject to wear a coating, edge, or point of a metal capable of resisting extreme abrasion. Since its introduction, the hard-facing process has spread rapidly and is today saving industry tens of thousands of dollars annually in maintenance costs.

Metal wearing parts protected with a coating of Stellite last, on an average, from three to ten times longer than those not so protected. As a direct result of this increased life, fewer replacements are necessary and equipment operates more continuously. This means less time out for shut-downs, more efficient production, and considerable savings in labor charges. Many parts that were formerly sent to the scrap pile can be salvaged, rebuilt, and put back into service at a cost considerably less than that of replacement with new stock, and the hard-facing operation can be repeated over and over again. It is little wonder that today literally thousands of wearing parts in practically every industry are protected against abrasion with a welded-on layer of Stellite.

There are many opportunities in the machine shop for the economical application of the hard-facing process. Trips, cams, dogs, gages, locating points in jigs and fixtures, hot trimming dies—these and many other machine parts subject to wear operate with greater accuracy and less interruption when hard-faced with Stellite.



A Hard-faced Blade for Cold-shearing 1/8-inch Steel Sheets Lasts Approximately Three Times Longer between Grinds than Hardened Steel Blades

In an Indiana plant, the dogs and cams on a nut-cracking machine used to wear out in two or three weeks, necessitating frequent shut-downs for replacement. When hard-faced with Stellite, these parts showed very little wear after being in continuous service for over a year.

One manufacturer furnishes four-bladed boring tools with Stellite wearing strips welded on the body to prevent chip wear on the bar. This bar stays on the job long after abrasion has scrapped ordinary tools.

Hardened tool-steel pins used for ejecting cans on an automatic can-forming machine used to require

replacement every six days. When hard-faced with Stellite, they showed but little wear after continuous service for sixty days.

Tool-steel centers for crankshaft turning and grinding used to last but one and one-half days at a Detroit automotive plant. Applying Stellite at a total cost of 28 cents has increased the life of the centers to nine days.

Slides for an eye-forming machine used at a spring and bumper plant formerly lasted but two months. After a year's service, hard-faced slides were still in good condition, showing little wear.

A Cleveland machine company applies Stellite to the surfaces of shear blades that are part of a machine for forging steel balls. Prior to the use of hard-facing, the best steel shears would run but one day without grinding. Stellited shear blades give from ten to fifteen days' service before it becomes necessary to regrind.

A mid-western twist drill company estimates that Stellited cams last ten times longer than new ones. These cams are hard-faced at a total cost of 34 cents, including material and labor.

A Michigan forge company obtained 6970 pieces from a hard-faced hot trimming die, while previous to the use of Stellite, a carbon tool steel die averaged only 500 pieces.

A company engaged in the manufacture of railroad cars uses dies over 9 feet long to bend the angles in 3/16-inch steel plate for box-car ends. Stellited corners on a mild steel base give many times the life of similar dies fabricated from high-speed steel. These few examples will serve to indicate the widespread economies of the hard-facing process in the machine shop.

The selection of a suitable base material for hard-facing is important. For parts requiring considerable resistance to shock and impact, such as hot and cold trimming dies, S A E 3140 steel has proved to be a particularly ideal base material. This steel will not mushroom under impact, since it can be given its standard heat-treatment after Stelliting.

Stellite welding rod can be applied by either the oxy-acetylene or the electric arc process, although the former is always preferred, since dilution of the hard-facing deposit with iron from the base metal can be held to a minimum. Another factor to be considered in connection with the arc method is that approximately 8 to 10 per cent of the electrode is lost through volatilization and spattering. Briefly, there are three important points to be borne in mind: (1) The surface to be hard-faced should be clean, free from dirt and scale; (2) an excess acetylene flame should be used; (3) the surface should be brought only to a sweating heat and not melted.

The aim in applying Stellite is to flow the alloy over the surface of the base metal when the latter is at sweating heat. If this is properly done, a strong junction is secured without any appreciable inter-alloying of the two metals. The exceptional properties of Stellite depend upon its non-ferrous composition of cobalt, chromium, and tungsten. Dilution with iron would reduce its ability to resist abrasion.

An excess acetylene flame must be used in order to secure the proper sweating of the base metal. It is necessary to see that no particles of scale are covered during the process. If these simple precautions are taken, any welder can, with a little practice, produce a good hard-facing job.

If the electric arc is used, the polarity should be reversed, making the rod the positive electrode. In using the arc, it is impossible to avoid some inter-alloying of the two metals, but this should be kept to a minimum. A 1/4-inch Stellite rod requires 175 to 200 amperes, and a 5/16-inch rod, 225 to 250 amperes. In the majority of cases, hard-facing deposits range from 1/16 to 1/4 inch thick.

The Automotive Industry in 1936

AT the beginning of 1937, there were more motor vehicles in operation in the United States than ever before. A survey made by the Automobile Manufacturers Association indicates that there were approximately 28,270,000 motor vehicles registered in the United States last year. This exceeds by nearly 1,500,000 the previous record established in 1930. All types of vehicles shared in this increase—passenger cars, trucks, and buses. That these cars were also operated at a higher average rate than heretofore is indicated by the fact that the gasoline consumption in 1936 amounted to 17,900,000,000 gallons, which was almost 10 per cent above any previous record.

The motor vehicle registrations throughout the world are also at a peak not previously reached. All together, there are some 40,000,000 motor vehicles in use in all the countries of the world.

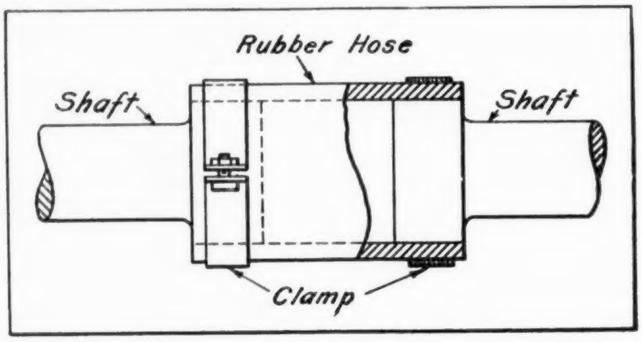
Another record was also established during the year which is not so satisfactory, perhaps, as those mentioned. The tax burden placed upon the users of the highways of the nation reached record figures. Highway users paid approximately $1,400,000,000 in special taxes to federal, state, and local governments during the year, not to mention gasoline taxes, which amounted to nearly $900,000,000 more. To the extent that these taxes are used for highway purposes, there is little to be said against them; but there is a tendency on the part of many governmental authorities to use motor tax funds for other purposes, and much of this taxation finds its way into the general funds.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Flexible Coupling for Small Shafts

A flexible coupling consisting of a helical spring made of rectangular wire and attached by means of screws to two shafts having the outer diameter



Rubber Hose Used as Coupling for Small Shafts

corresponding to the inner diameter of the spring was described in March, 1936, MACHINERY, page 458. A coupling with similar shock-absorbing qualities can be made by using a piece of rubber hose in place of the metallic helical spring employed in the device previously described.

The piece of hose may be of the kind used on automobile radiators, which has a woven core impregnated with rubber. Such hose is usually available in any size, to correspond with the dimensions of the shafts or disks. Two inexpensive hose clamps can be used to fasten the hose in place, as shown. If the pressure between the disk and hose should not prove sufficient for the drive, the outer surface or periphery of the disk should be roughened with a coarse file.

PAUL GRODZINSKI
Berlin-Charlottenburg 4, Germany

Eliminating Static from Belt Drives

The amount of static developed by rubber belts passing over steel pulleys may be sufficient to cause serious trouble, particularly in cases where the drive operates in a moist atmosphere. It has been found that the development of static in such cases can be eliminated by first cleansing the belt of soapstone or other greases, and then dipping it in a solution made up of one part of concentrated colloidal graphite in water diluted with five parts of distilled water.

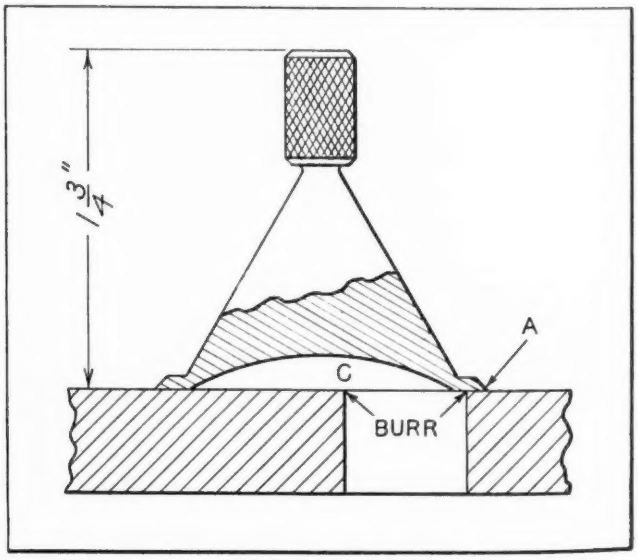
The same result can be secured in the case of assembled machines by holding a paint brush saturated with the graphite solution against the moving belt. Dispersions of lampblack or other finely divided carbon in lacquers may also be used for the elimination of static, although the latter materials are not so easily applied as the colloidal graphite mixtures.

New York City — B. H. PORTER

Burr Trimming Tool

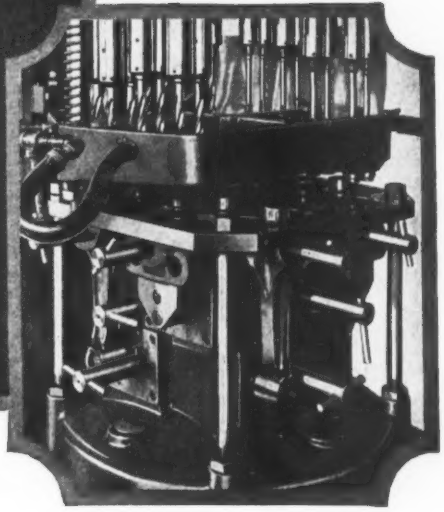
Many machining operations leave a burr on the work which can be easily removed or trimmed off with a tool like the one shown in the illustration without marring or scratching the surface, as is often the case when a file is used. This convenient tool is turned with a clearance at *C*. It is made from good quality tool steel, and the cutting edge is hardened at *A*. Although the illustration shows the tool as 1 3/4 inches high, it can, of course, be made larger to suit the work to be done. When the tool is being used, it is given a turning slicing motion, in order to make the knife-like edge cut better.

Chalfont, Pa. — CHARLES A. MARTIN



Tool for Removing Burrs

Design of Tools and Fixtures



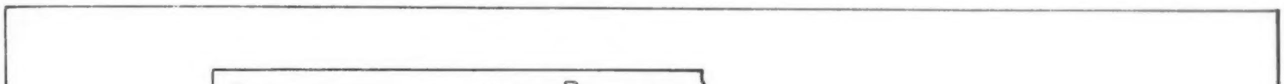
Multiple Perforating Die with Selective Punch Arrangement

By JOHN A. HONEGGER, Bloomfield, N. J.

A multiple perforating die with punches that can be operated selectively to suit spacing requirements of different parts is shown in the accompanying illustration. This die was designed for perforating bolt holes in sections for steel bins and shelving.

The soft tool-steel block *A* is fastened to the die-shoe *B* in the usual manner. Hardened steel perforating bushings *C* are inserted in the block *A*. A stripper *D* is fixed to the die-block and is separated from it by a combination spacer, guide-plate extension, and adjustable stop-holder *F*. An adjustable stop-arm *G* can be clamped in the desired position on the spacer at the rear of the die. If desired, a graduated scale can be added to facilitate setting the stop.

The punch-holder assembly is designed to permit varying the spacing of the perforated holes. To the



Multiple Perforating Die Equipped with Stops that Permit Any Desired Number of Punches to be Thrown in or out of Operation

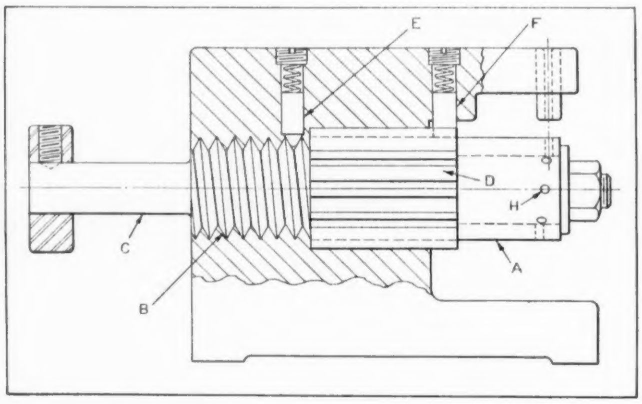
punch-holder *H* is fastened the punch-plate *J*. This punch-plate is made unusually thick to obtain a long bearing for the perforating punches *K* and the sliding stops *L*. Plate *J* is milled out to receive the stops *L*, as indicated in the plan view *M*, in which the punch-holder is omitted.

Two dowels *N* locate plate *J* on the punch-holder, while screws *P* hold these members together. The slots at the front end of plate *J* prevent the use of fastening screws at this point, and for this reason, bands or strips *Q* are fastened in place, as shown.

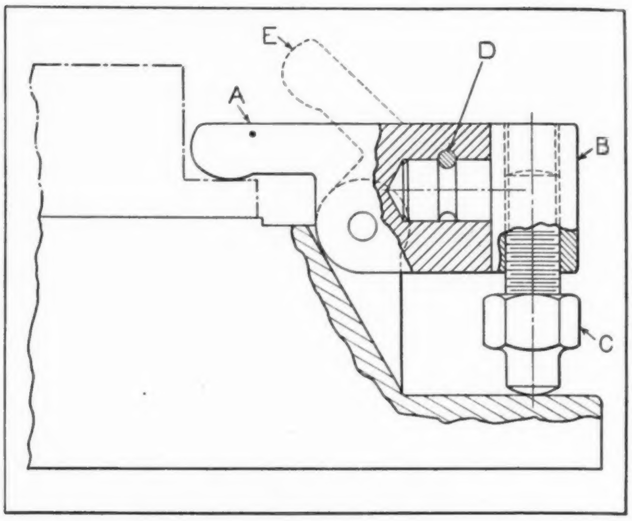
One of the stops *L* is shown in the cross-section view to the right. This stop has a step at *S* and a stop-plate *T* which limit its outward movement. When withdrawn, the end of the stop is in the position indicated by the dotted lines at *U*. At this point, the spring ball detent *V* enters the recess *X*, thus preventing the slide from being accidentally moved in and causing the punch to pierce the work. Similarly, when the stop is in the innermost position, the spring ball detent enters the notch at *W* and holds the stop in a closed position.

On the outer end of each stop, as at *Y*, is stamped the distance from the stop to the guide, so that it is simply necessary to pull out or push in the designated stops in order to pierce holes at the required positions. The operation of the die is simplified by this equipment. Thus, if holes are to be pierced at 1, 3, and 6 inches from the edge of the work, the stops bearing these numbers are pushed in and all other stops are pulled out. The stop *G* is set for the required distance at right angles to the three dimensions given. The work is then run through, after which the stops *L* for the next series of holes are set and the stop *G* is again adjusted.

If only a few pieces are to be pierced, the stop-gage is pushed out to its outermost position and the parts are located by means of the graduated scale, using guide *F* for squaring up the work. If the punches are set so that they enter the die about 0.005 inch only, the punches that have their stops pushed in will pierce holes in the work. All the remaining punches will simply come in contact with the work and ride upward as the ram moves down, without piercing the work.



Indexing Jig Used in Drilling Lubricant Holes in Bushings



Quick-acting Clamp with Low Overhead Clearance

Quick-Acting Clamp

The quick-acting clamp with a low overhead clearance here illustrated can be used to advantage on jigs and fixtures for certain kinds of work. It consists of a pivoted clamping finger *A* fitted with a pivoting member *B*, and the threaded jack-screw *C*. The member *B* is retained in the clamping finger by pin *D*.

In operation, jack *C* is screwed down until the work is clamped securely. To remove the clamp, the jack is given a turn or two and then swung aside. The weight of the clamp causes it automatically to take the position shown by the dot-and-dash lines at *E*, which allows the work to be easily removed. A. H. J.

Spiral Indexing Jig for Drilling Lubricant Holes in Bushings

By WILLIAM C. BETZ, Equipment Engineer
Fafnir Bearing Co., New Britain, Conn.

Bushings such as shown at *A* in the accompanying illustration sometimes require the drilling of graphite or grease holes *H* spaced in a spiral or helical line. Often these bushings are drilled in sufficient quantities to warrant the construction of a simple jig like the one shown. The body of this jig is made of cast iron and has a thread *B* of the same lead or spiral as is required in the row of holes to be drilled. The stud *C* has notches milled in the collar at *D* for indexing by means of plunger *F*. These notches correspond with the number of holes required in one turn of the bushing.

Turning the stud *C* serves to index the bushing *A* for spacing the holes on a spiral line or helix corresponding to that of the thread *B*. If an annular instead of a spiral arrangement of the holes is desired, the screw thread is eliminated and a

series of grooves is turned in the stud. The spring indexing plunger E is then added for spacing by means of the annular grooves in stud C, which is pushed forward or backward as the case may be, so that the plunger pin engages succeeding grooves.

Reducing Tool Costs by Keeping Detail Parts in Stock

By J. J. HUBER, Chief Tool Designer
General Factory Division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The importance of short-cuts in designing to keep the cost of drawings for tools at a minimum, and also the importance of stocking jig and die parts used for repeat orders, cannot be overstressed. In the large electrical plant of the Westinghouse Electric & Mfg. Co. at East Pittsburgh, Pa., it has been found advantageous to manufacture and carry in stock twenty-four commonly used parts for jigs, fixtures, and molding work; thirty-nine parts for die and bender work; nine items of hardware; and other parts, aggregating 342.

Aside from the low cost of these stock parts, the advantage of time gained in rushing through repair or new work is considerable. Estimating and cost computing time is also lessened. The advantage of carrying a part in stock depends on its yearly activity, and the amount or quantity to be manufactured at a time is based on offsetting the tool set-up cost. Considerable designing time is saved by furnishing each tool designer with a special book showing standard parts, steel plates, and bar materials and giving formulas, together with sample sketches. In making an ordinary milling fixture, for example, the designing time is lessened by omitting details on the drawings of items such as studs, nuts, washers, springs, and various other details kept in stock, simply indicating these parts by numbers on the drawings. For example, a plain outline of a stud with the numbers 8, 9, 10, and 11 enclosed by circles would indicate a stud, hexagonal nut, washer, and spring, all of which are assembled at the point indicated on the drawing. Dimensions of these parts need not be shown, as the specifications are given in the bill of material.

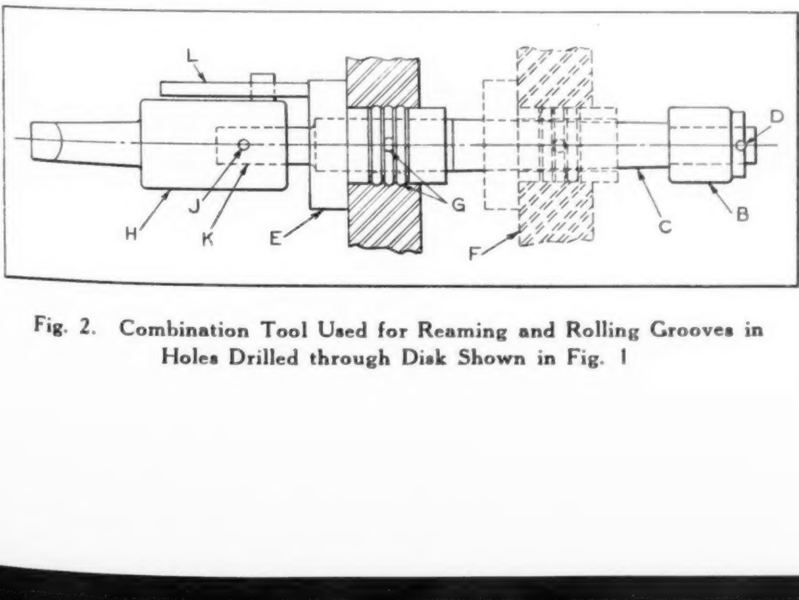


Fig. 2. Combination Tool Used for Reaming and Rolling Grooves in Holes Drilled through Disk Shown in Fig. 1

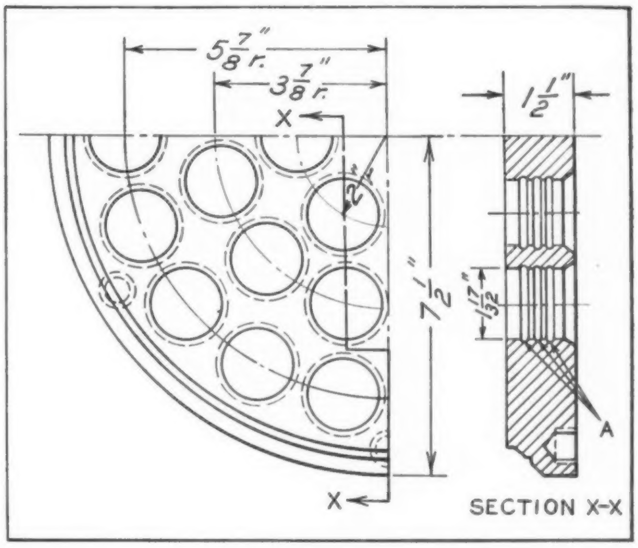


Fig. 1. Section of Steel Disk with Thirty-six Holes in which Grooves A are Rolled

Tool for Rolling Three Grooves in Holes Drilled Through Steel Plate

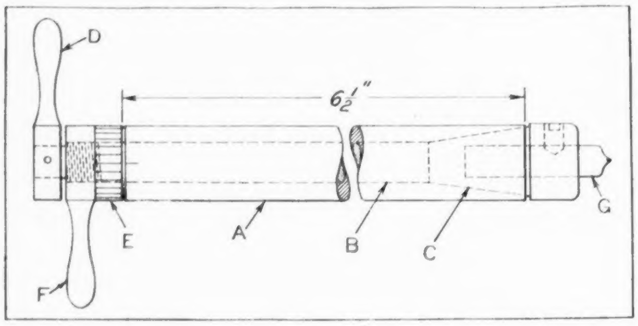
By CHARLES C. TOMNEY, New Brunswick, N. J.

A cold-rolled steel disk, turned to a diameter of 15 inches and chamfered on one edge, as shown in the quarter-section view, Fig. 1, has thirty-six 1 1/2-inch holes drilled through it. The holes are evenly spaced on three circles having radii as shown in the illustration. The problem of reaming the holes to a diameter of 1 17/32 inches and rolling three grooves A to a depth of 0.020 inch in each hole was solved by designing the special combination reamer and groove-rolling tool shown in Fig. 2.

The hole is first finished to size with the reamer B, which is fitted to the end of the tapered mandrel C. A cross-pin D serves to drive the reamer. The ball retainer E, equipped with steel balls G which roll the grooves in the work, is a running fit in the reamed hole in the work. This ball retainer is inserted as shown in the dotted-line cross-section at F. The nine balls in the retainer are located in radial holes in three rows, three equally spaced balls being provided for rolling each groove. Four grooves, 1/32 inch wide by 1/32 inch deep, are machined in the ball retainer and fitted with wire rings which prevent the balls from leaving the radial holes in the retainer E.

The end K of the tapered mandrel is a loose fit in the tapered-shank driver H. This allows the tool to have a floating action on the driving pin J. The retainer E is driven by pin L, as it is necessary that the retainer turn with the mandrel in order to prevent the balls from remaining in one place, which would cause them to break.

The steel disk or work is shown by dotted lines at the beginning of the groove-rolling operation. As the tapered mandrel is fed downward, the wedging action against the balls forces them outward, thus producing the required grooves.



Truing Diamond Holder Equipped with Indexing Device

Indexing Holder Reduces Truing-Diamond Cost

By HECTOR J. CHAMBERLAND, Springfield, Mass.

While grinding machine operators are generally instructed to turn the nib or bar of a wheel-truing diamond occasionally to present a new working surface or spot to the wheel, the writer knows from experience that Dick usually leaves it to Harry to do the turning act. Thus the same spot on the diamond is often used for a dozen wheel dressings and frequently for an entire day, depending on whether or not the bar is removed from the fixture. The longer the diamond is used without turning the holder, the wider the flat on the diamond becomes and the larger the area exposed to the sudden changes of temperature, which eventually causes cracks in the diamond. Meanwhile, the quality and quantity of work produced suffers, as the diamond becomes blunt.

The writer recommends multiple settings and impregnated diamond tools for most wheel-truing purposes. However, the single setting method will always be used for heavy grinding wheels, provided due consideration is given the selection and care of the diamond and holder.

The writer believes that the principal reason why diamonds fail to give satisfactory results continually is that no convenient means of bringing a fresh cutting edge into position for every dressing operation has ever been introduced. The device shown in the accompanying illustration has been designed for this purpose. This device simply replaces the conventional diamond-holding bar and affords a quick and convenient means of obtaining a given number of accurately spaced dressing points. It was made for wheels used on Norton and Landis cylindrical grinding machines. The dimensions can be changed to suit requirements.

The body *A* is a piece of seamless steel tubing having an outside diameter of 1 inch and a bore of 1/2 inch. The spindle *B* has a lapped taper fit at *C*, designed to prevent vibration. At the opposite end of spindle *B* is fitted an indexing handle *D*, which is pinned in place. The collar *E* has twenty-five divisions or graduation marks and is a sliding fit on bar *B*. A key prevents this collar from turning on the bar. A locking handle *F*, threaded to fit the thread on bar *B*, is used to clamp the bar in position after each indexing movement.

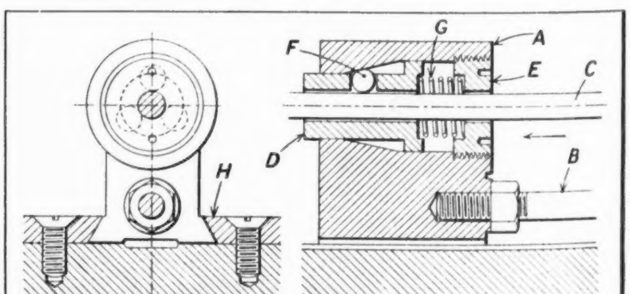
With this arrangement, the grinding wheel can be dressed twenty-five times to each revolution of the spindle *B*, a new surface of the diamond being used each time. If the diamond nib *G* is given a one-fiftieth turn, say after two revolutions of the shaft or fifty dressings, this will automatically bring forth twenty-five new truing points. The latter points are, of course, the sharp intersections resulting from the previous indexing movements.

Several tools like the one shown in the illustration have been made up which considerably increased the efficiency of grinding wheels, in some cases doubling the life of the diamond.

Simple Chuck for Rod-Feeding Device

The first requirements of a rod-feeding device are simplicity, accuracy of feed, and non-scoring of the rod. A chuck for such a device embodying these essential features is shown in the accompanying illustration. The main body *A* slides in the dovetail guide *H* and is moved to and fro by a separate cam mechanism (not shown) through the rod *B*, thus feeding the stock *C* forward. The body *A* is bored out, tapered, and threaded to take the bushing *D* and the nut *E*.

The bushing *D* is drilled to carry three equally spaced balls *F*, both the bushing and the nut being recessed to take a light spring *G*. The action is that of a ball ratchet. The body first runs back in the direction of the arrow, during which movement the balls ride back away from the taper and the spring is compressed slightly. The movement of body *A* is then reversed. This motion, aided by the spring, causes the balls to jam between the stock and the taper and so feed the rod or wire forward the required amount. This device is very compact, and has given satisfactory service. B. M.



Ratchet Type Feeding Device for Round Stock

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

A. C.—In deep drawing operations, the writer has experienced difficulty due to the metal from the drawn work rubbing off and adhering tenaciously to the surfaces of the die. This "built-up" metal results in a roughness that produces grooves in the finished part. The built-up metal can be scraped off the die surfaces readily, but it is a source of considerable annoyance in that it causes defective work. Can any of the readers of MACHINERY tell how this difficulty can be avoided?

Answered by Albert A. Cavicchi, Arlington, Mass.

It is not mentioned whether a lubricant is used in the drawing operation. If the shell is drawn dry, the trouble is caused by the heat generated by the drawing action. This heat expands the tools, thereby reducing the space between the punch and the die to less than the thickness of the metal being drawn. A lubricant, therefore, should be used. There are a number of oils on the market for this purpose. The writer has found a cutting compound of the same type as is used in engine lathe work suitable, but a heavier mixture is desirable. A mixture of ten parts of water to one part of oil has been found satisfactory. The shells can be dipped in this compound or the compound can be applied to the die as the shell is being drawn. Shells should never be drawn dry.

If a lubricant is used in the operation described and the metal is still scraped off the shell, the trouble is caused by the edge of the drawing die. The edge is too "square." The drawing edge should be stoned until it has a sufficient radius so that it will not scrape the metal being drawn.

Answered by Bernard G. Ross
T. & H. Proprietary Limited, Melbourne, Australia

The writer has experienced trouble, at various times, in deep drawing operations from the drawn metal adhering to the surfaces of the die.

The most important cause of this difficulty is unsuitable lubrication and lack of cleanliness. An excellent lubricant for either brass or steel consists of a mixture of precipitated chalk and machine oil. Cleanliness is essential for the successful drawing of any metal. Too much emphasis cannot be laid on this point, and every precaution should be taken to insure that the raw material is free from all foreign matter. Care should be exercised in subsequent drawing operations to see that the shells are kept clean.

The speed of the press is an important item. If the speed is too great, the friction will result in overheating the shell and will cause the metal to score and adhere to the surface of the die. In one case, the writer reduced the speed of the press from 120 to 90 strokes per minute, and, in so doing, overcame the trouble.

It is necessary that the correct clearance between the punch and die be observed. Usually, the diameter of the die should be 0.005 inch plus the double thickness of the stock greater than the diameter of the punch. Different metals require different clearances. The best method of finding the most suitable clearance is by trial.

The selection of the sheet stock is of importance. It is false economy to purchase inferior metal. In most cases, when inferior metal is subjected to a deep drawing operation, the skin of the metal fractures and flakes, scoring the die. The result is that the press is out of commission while the die is being scraped or lapped.

Last, but not least, is the selection of a suitable tool steel for the drawing die and its correct heat-treatment. It is often advisable to consult the supplier of the steel in regard to this. Great care should be taken in the hardening of the die. If it is cylindrical in shape, the bore should be machined to about 0.015 inch under the required size and ground to the correct size after hardening. In the case of an irregular shaped die, precautions must be taken to prevent the steel from decarburizing on the surface.

Answered by John J. McHenry, Detroit, Mich.

In asking his question relating to deep drawing difficulties in December MACHINERY, A. C. neglects to mention the approximate sizes of the shells being drawn, which may be a factor—nor does he mention the material. The writer assumes that the shells are made from steel.

The difficulties referred to are frequently encountered and cannot always be completely eliminated. For example, if a shell is required of an even metal wall-thickness, and of such dimensions as to require a considerable number of redrawing operations, there is no way to entirely avoid the trouble. Ordinarily, however, a slight variation in

the thickness of the wall metal is not objectionable, and in such cases, the difficulties can be overcome. The causes of defective work due to "built-up" metal may be:

1. Insufficient clearance between the punch and die. Never attempt to iron out the shells unless this seems to be absolutely necessary; if it is necessary, do not expect a shell entirely free from the defects mentioned.
2. Using stock of the wrong temper and analysis. For deep-drawn shells, use deep-drawing stock.
3. Blank-holder rings or dies having local soft spots. Change the die steel or the hardening method. If an alloy steel is used, it may be necessary to change the analysis.
4. Unsatisfactory lubrication. White lead and oil have been found to give good results, but the cleaning of the parts is difficult. There are many satisfactory lubricants on the market. Some experimentation is the best road to success.
5. Grit accumulated in the drawing solution. Keep the containers completely covered when not in use, and start off with a thoroughly clean solution.
6. Insufficient importance attached to wiping off blanks before drawing. Use clean towels and change them when slightly soiled. If the blanks are not clean, scratching and freezing will result.
7. Incorrect taper on blank-holder. On large shells, especially, the taper ground on the blank-holder surface must be determined by trial and is extremely important in preventing the formation of wrinkles. Do not try to iron out wrinkles; prevent their formation.
8. Incorrect rounding of the corner of the die. The rounding of the corner of the die is important. It is rarely a true circular arc; it is more nearly a parabolic curve, gradually receding from the die face. It may or may not end "abruptly" at the die diameter.

Answered by C. G. Williams, Davenport, Iowa

If the material to be drawn is well lubricated with a thick solution of yellow (rosin) soap and water, so thick that it is almost stringy, it is not likely that there will be any trouble from the punch or die picking up particles of metal and thereby scoring the work. Soft soap and water may also be used, provided that the finished parts are not allowed to stand for any length of time with the coating of soap on them, because soft soap will corrode both ferrous and non-ferrous metals.

"Hot Milling"

L. N.—I understand that abroad, for the production of boring tools for mining and other tools and implements that do not require a very high finish, a method is being used known as "hot milling." The process, as I understand it, consists of using special types of milling cutters for milling the required grooves in the metal while hot. To what extent is "hot milling" being practiced in this country for purposes such as mentioned?

This question is submitted to MACHINERY'S readers.

When Guarantees are Not Fulfilled

B. N.—Suppose that we sell equipment and do not comply with our guarantee, and that, at the same time, the purchaser does not fulfill his obligations; who is responsible to the other?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

It is well established law that a purchaser may automatically forefeit all his rights to sue and recover damages from a seller by failure to comply with his assumed obligations up to the time he files suit to rescind the contract. For example, in Advance v. Scawo [268 Pac., 738], it was shown that a purchaser accepted and used equipment, but refused to pay for it on the contention that the seller had induced him to enter into the contract of sale by inserting into the written contract a warranty that the seller knew could not be fulfilled.

The seller filed suit to collect the account, and subsequently proved that the buyer himself had failed to comply with the written terms of the contract. In view of this testimony, the lower Court held the buyer not entitled to rescind the contract. The buyer then appealed to a higher Court and attempted to introduce testimony proving that the seller's salesman had made false oral statements for the purpose of inducing him to sign the contract. However, in view of the fact that the buyer had failed to fulfill his obligations under the contract, the Court held the seller entitled to recover the full purchase price.

Also, in this case, the higher Court held that when a seller gives a written guarantee, the buyer cannot refuse to pay for the merchandise on the grounds that he relied upon a verbal statement or guarantee of the quality of the equipment. The Court said: "The general rule is that, where express warranties, covering the identical representations of the seller, are inserted in the contract, the buyer is presumed to have relied upon the warranty and not upon the representations, and cannot, therefore, base a charge of fraud on the falsity of the representations."

* * *

The total number of passenger cars built in 1936 in the United States and Canada amounted to approximately 3,770,000; the number of motor trucks reached 800,000. This is an increase of 11 per cent over the production in 1935.

$300 in Prizes for Articles on Ingenious Mechanisms

MACHINERY offers sixteen prizes for the sixteen best articles on ingenious mechanisms, each article to be confined to one mechanism or mechanical movement.

Two prizes—each, $50 Four prizes—each, $25 Ten prizes—each, $10	in addition to regular space rates

MACHINERY'S regular space rates will be paid not only for the prize-winning articles, but also for any articles accepted for publication that may not receive a prize.

Each contestant may send as many articles as he wishes. All will be entered in the competition and all may be accepted for publication; but no contestant will be awarded more than one prize.

Articles entered in this competition should be addressed to the Editor of MACHINERY, 148 Lafayette St., New York City. They must be mailed on or before March 15.

Preparing Articles for the Competition

This competition applies to any kind of mechanism making use of a practical and ingenious mechanical motion or principle. The competition is open to all, whether subscribers to MACHINERY or not. The general procedure is very simple.

1. Send a drawing of the mechanism (or photograph, if preferred—or both) that clearly shows all important parts of the particular movement to be described.
2. Describe as clearly as possible both the *purpose* of the mechanism and its *action—how* it does *what* it does.
3. Mark the important parts on the drawing, such as levers, cams, etc., with letters, *A*, *B*, etc., and use corresponding letters to identify those parts in the description; thus: "Lever *A* is operated by cam *B*." This will help to make the description readily understood.
4. Confine each article to a single mechanism or movement, and do not describe an entire machine or refer to parts that do not affect the movement being described.

Suggestions about Illustrations and Manuscripts

Clear blueprints or pencil drawings with distinct lines are satisfactory. They should be made on separate sheets of paper. Send only drawings that are "to scale," with the various parts shown in correct relationship and proportion. Rough freehand sketches cannot be used. The drawing must show the assembled mechanism, although a diagram, or a drawing that is partly diagrammatic, may often be substituted to advantage, especially if it more clearly illustrates the arrangement of a complicated mechanism.

It is more essential that important facts be clearly stated than that the manuscript be neatly written; but carefully prepared manuscripts usually indicate careful thought.

Avoid describing a mechanism that is familiar to most designers; descriptions of movements that are generally known cannot be accepted, even though they may be very ingenious. It is immaterial how long ago a mechanism or movement was originally designed, provided it has not previously been described in any publication or text-book.

Important Suggestions

Be sure to describe as clearly as possible both the purpose of the mechanism and its action — what it does and how it does it. Describe the purpose first, and the means of accomplishing it afterward.

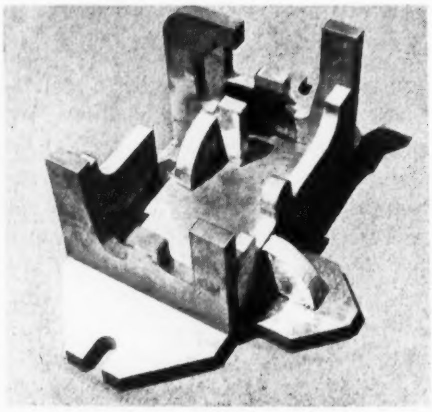
Confine each article to a description of a single mechanism or mechanical movement. Do not attempt to describe the entire machine of which the mechanism or movement is a part. Clear descriptions of separate mechanisms, rather than descriptions of entire machines are desired. Omit, as far as possible, reference to parts of the machine that do not affect the movement being described.

Do not describe mechanisms that are familiar to most designers. On the other hand, it is immaterial how long ago a mechanism or movement was designed; but it must not have previously been described in any publication or text-book.

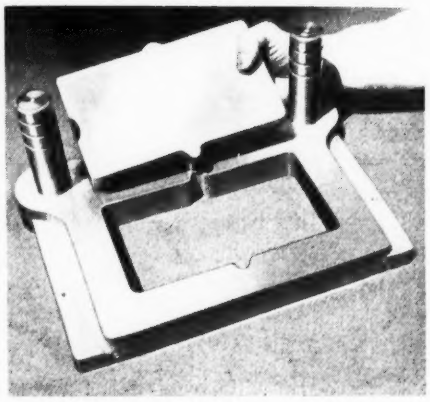
Unusual Jobs Performed by Metal Sawing

(Left) Savings in Time and Cost as Great as 20 to 1 have been Achieved in Metal Cutting with the Continuous Continental "Do-All" Sawing Machine

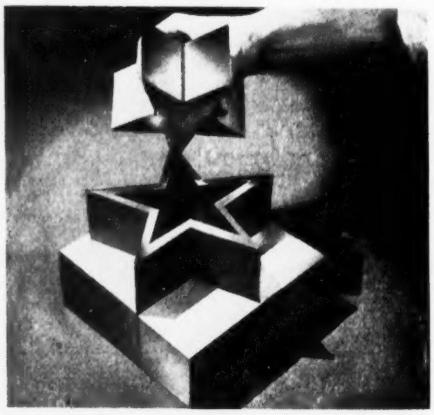
(Right) Cutting a True Circle, Using an Adjustable Center in the Work-table as a Pivoting Point at Any Desired Distance from the Saw



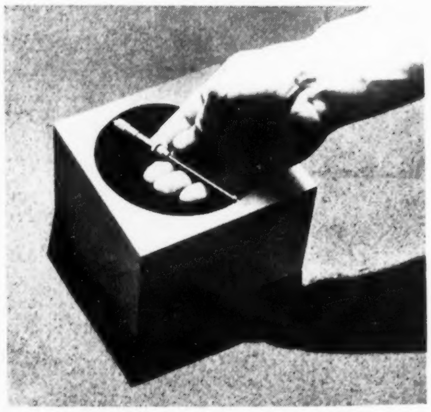
(Left) A Jig Frame in which Eight of the Units were Cut out in 2 1/2 Hours by Narrow-blade Continuous Sawing to Very Close Limits of Accuracy



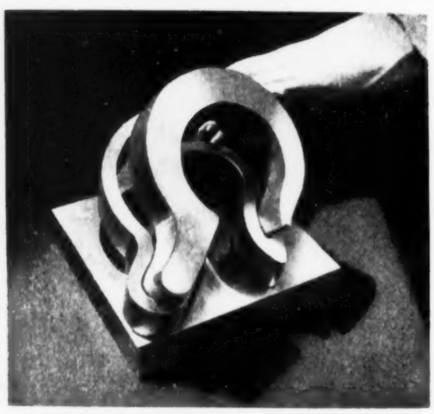
(Right) One Starting Hole and 28 Minutes of Sawing Time was All that was Required to Cut out this Die-shoe Hole. The Clearance is Put in with the Saw



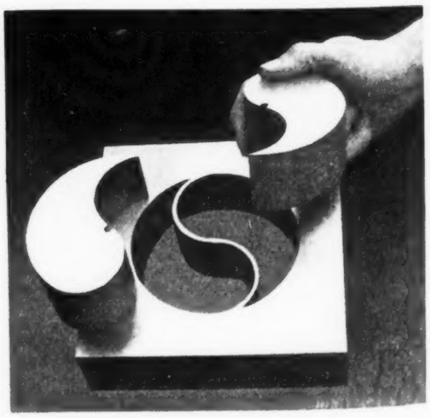
(Left) The Inside of a 4-inch Thick Tool-steel Star was Cut in One Hour; the Outside, in 1 1/4 Hours. Size Variation from Top to Bottom, Less than 0.002 Inch



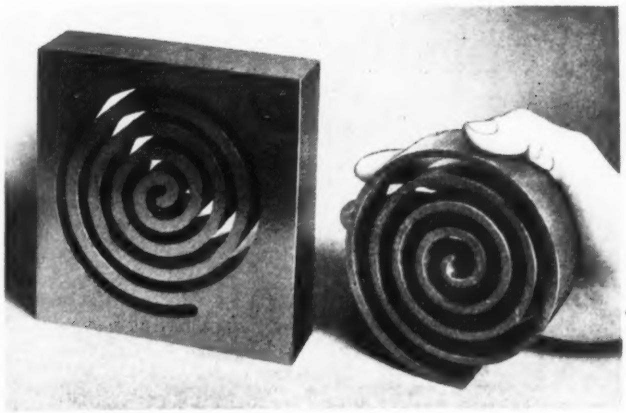
(Right) The Special Cam Shown in the Upper Right-hand Corner of Page 399 was Cut out from this Block to Remarkably Close Limits of Accuracy



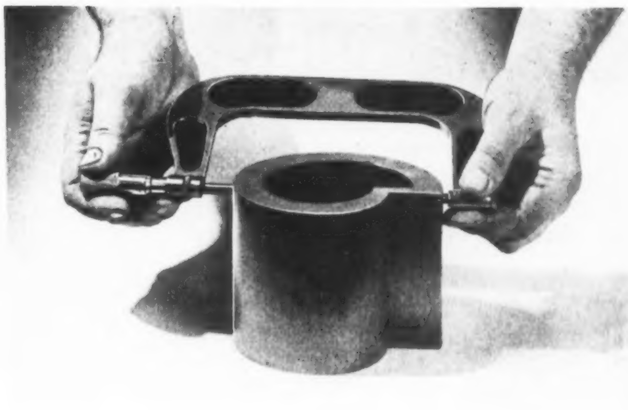
(Left) One Starting Hole and 90 Minutes of Sawing Removed the Inner "Cut-out"; Then Two Hours Completed the Outside Shape of this Special Hook



(Right) Another Example of a Job for which the Narrow-blade Saw Furnishes Practically the Only Means of Obtaining the Required Results

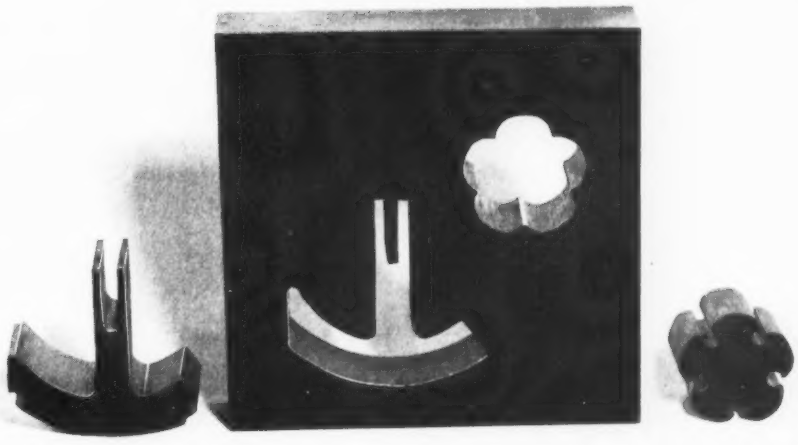


The Cutting of this Spiral and Its Removal Intact is a Job that Most Machinists would Consider Next to Impossible to Perform, but Here is the Evidence



This Special Cam was Formed Inside and Outside by Narrow-blade Sawing. It is Parallel within Less than 0.002 Inch from Top to Bottom

This Die was Sawed out in 45 Minutes. Note the Turning Holes for the Saw Drilled at the Corners



The Time Required to Cut out these Die-holes was 20 Minutes for the Left and 25 for the Right. The Saw was Held to within 0.008 to 0.010 Inch of the Scribed Line, Necessitating Very Little Finishing

Why the Demand for Machine Tools Has Increased

The orders for machine tools received by members of the National Machine Tool Builders' Association in December represented the highest volume of business placed in any one month since 1919, according to an announcement by Clayton R. Burt, president of the Niles-Bement-Pond Co., who is president of the Association.

Commenting on this high level of new business, Mr. Burt stated that it is due largely to a realization on the part of machine tool users that higher taxes, higher material costs, and higher wages constitute a threat to continued good business and employment opportunities unless some means are found to offset them. The means lies in the use of the latest improvements in machinery and methods. While taxes, costs, and wages rise, the cost of goods per piece or unit may be held down or even lowered by the use of efficient machinery, especially in mass production. In that way only can the higher wages be translated into an actual increase in purchasing power. Industry has recognized this fact, and hence there has been a steadily increasing demand for the latest type of production machine tools. If this fact were recognized by political and labor leaders as well, the nation could enter on a period of real prosperity for all.

External Threading on Tapping Machines

By H. GOLDBERG, Vice-President
R. G. Haskins Co., Chicago, Ill.

THE cutting of external threads with self-opening die-heads, button dies, Acorn dies, or other types of dies is well understood by most shop men, especially when the threading is done on conventional machines, such as the hand screw machine, automatic screw machine, threading machine, or lathe. Many threading operations performed in the conventional manner can, however, be done to better advantage on reversible type tapping machines.

Threading on a tapping machine, however, is not so well understood by the average shop man and is not so commonly employed, because many tapping machines are not suitable for external threading. Owing to the inaccuracies that develop as a result of the floating construction of the spindle, inertia, lack of sensitivity, etc., comparatively few attempts have been made to utilize tapping machines for external threading. Although most threading jobs can be done to better advantage in the usual manner, there are many jobs that can be done more economically on a tapping machine.

A tapping machine for external threading must have a rigid, non-floating spindle. The spindle of the machine that reverses must be light in weight and must be in balance, so that the die will not run in reverse. A tapping machine with an unbalanced spindle, which causes the die to revolve continuously in the direction required for threading, is also unsuitable for high-class work.

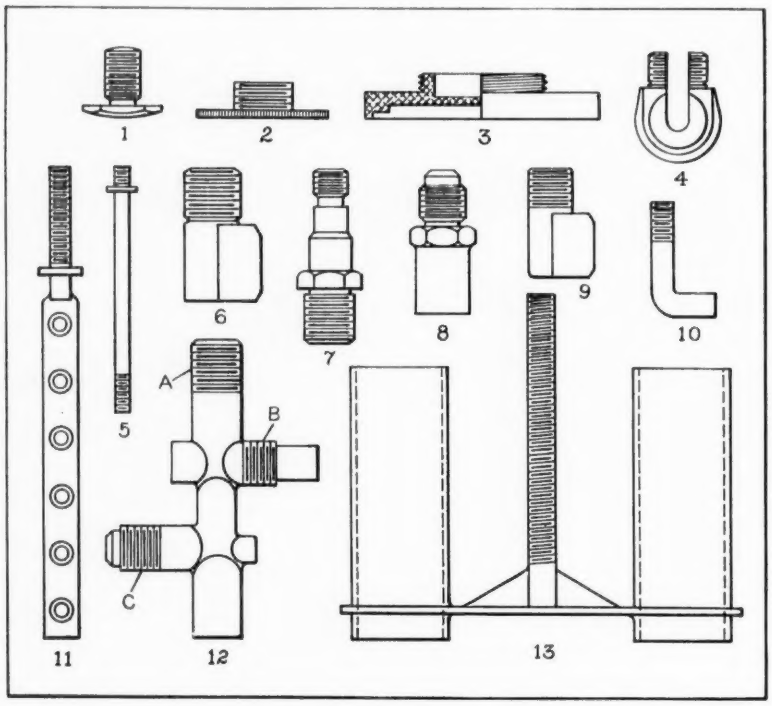
Production Rates Obtained in Threading Pieces Shown in Illustration on a Vertical Tapping Machine

Piece No.	Material	Diameter and Number of Threads per Inch	Length of Thread, Inches	Number of Pieces Threaded per Hour
1	Brass	5/16–18	1/2	1400
2	Zinc Die-casting	1/2–20	1/4	1200
3	Zinc Die-casting	1 1/8–32	1/8	725
4	Zinc Die-casting	1/2–20	9/32	1150
5	Brass	6–40	5/32	1600
6	Brass	1/4-inch Pipe	15/32	1550
7	Brass	5/16–24	1/4	1650
8	Brass	3/8–24	5/16	1600
9	Brass	1/8-inch Pipe	5/16	1700
10	Copper	3/16–24	5/16	1500
11	Aluminum	10–24	7/8	950
12–A	Brass Forging..	1/2–20	7/16	1450
12–B	Brass Forging..	5/16–24	1/4	1300
12–C	Brass Forging..	5/16–24	11/32	1250
13	Zinc Die-casting	Triple Thread 1/4–20	2 7/16	750

A die that revolves in the reverse direction while in contact with the work will have the chamfer or throat dulled very quickly, and hence its life will be comparatively short. The spindle must be of very rigid construction, as otherwise, no two threads will be alike. If the spindle has a floating action, the die will usually start crooked and the thread will not be in alignment with the previously finished surfaces.

A high-speed, sensitive, tapping machine is well adapted for threading certain classes of work that must have the thread cut up to a shoulder. This is rather difficult to accomplish on the average screw machine or threading machine. Certain classes of work requiring great accuracy can be handled more readily in a sensitive tapping machine than in any other type of threading equipment. This applies especially to the threading of smaller sizes, up to 1/2 inch on brass and non-ferrous materials.

The threading of steel on tapping machines is not recommended, because the die revolves and the work is stationary—a condition that makes it difficult to direct sufficient oil to the cutting point, as the average die has a tendency



Typical Examples of Work Threaded on Tapping Machine

to throw off the oil. For this reason, no attempt should be made to thread steel work on the reversible type tapping machines, unless the thread is very short—that is, the length of the thread should be less than the diameter.

Threading on a vertical type tapping machine has many advantages. One is the easy disposal of chips. The work can usually be chucked or clamped in such a manner that it will automatically fall out into a chute when released. This reduces the time required for handling. The vertical tapping machine also enables very short threads to be cut, as the die automatically reverses itself. This permits cutting a single thread to a shoulder with a high degree of accuracy.

Die Requirements for External Threading

The Acorn die, made by the Greenfield Tap & Die Corporation, is especially well adapted for cutting external threads on a tapping machine. This die is light in weight, easily adjusted to size, has ample chip room, and can be easily resharpened. Dies must, of course, be kept sharp, and they must have the correct amount of cutting rake. It is important that the work be accurately aligned with the axis of the die and that the die run true in its holder. Any inaccuracy in the die, besides placing a strain on the die prongs, will be exaggerated in threaded work.

The outside diameter of the work must be kept within the maximum tolerance to prevent the removal of too much metal, which, in turn, makes it difficult to hold the thread to size. A die should never be adjusted beyond its specified range. If it is necessary to cut threads to a larger or smaller pitch diameter than the standard, it is better to order special dies for this purpose than to adjust a standard die to cut too small or too large.

Typical examples of external threading on a vertical tapping machine are shown in the illustration. These jobs were all threaded in very simple fixtures. The threading data and production rates pertaining to the pieces shown are given in the accompanying table.

Gear Designing Rules, Formulas and Examples—A New Book

GEAR DESIGN SIMPLIFIED. By Franklin D. Jones. 134 pages, 8 1/2 by 11 inches; 201 illustrations. Published by THE INDUSTRIAL PRESS, 148 Lafayette St., New York City. Price, $3.

THIS book consists exclusively of working rules, formulas, and data actually required by the designer and shop man in producing various types of gears. The theoretical side of gear design has been excluded, in order to condense and simplify the book. The types of gears dealt with include spur gears, internal gears, straight-tooth bevel gears, spiral-bevel gears, helical gears for parallel-shaft drives, helical (spiral) gears for angular drives, herringbone or double-helical gears, and worm-gears. There is also a section on the figuring of speeds and ratios, which includes various transmissions of the planetary type. Another section contains rules and formulas for determining the power-transmitting capacities of different types of gears.

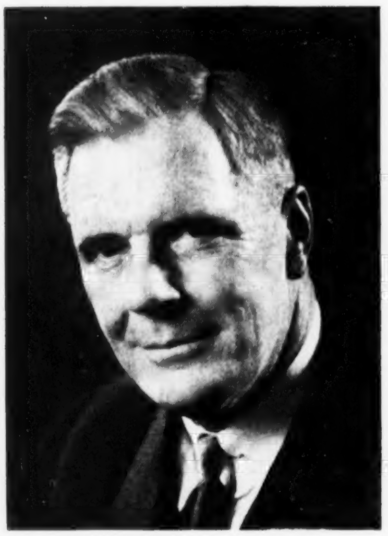
All gear problems are presented in simple chart form. Each problem is illustrated by a drawing or diagram showing clearly the dimension or angle required. Directly opposite this drawing is the rule (and equivalent formula) for determining that particular dimension, angle, or other value. Then follows, in each case, an example showing exactly how the rule or formula is applied in actual practice. All gear problems throughout the book are presented in this way, and 201 drawings are used to illustrate the different classes of problems connected with the designing and cutting of gears. Whenever any problem has more than one solution or angle of approach, the different solutions are given, with the rules, formulas, and worked-out examples for each case.

This book explains the general application and advantages of different gear-tooth standards, such as the American standard 14 1/2-degree and 20-degree full-depth involute systems; the American standard composite system; the different stub-tooth systems; and the standard module system employed in countries using the metric system of measurement. Tables of tooth parts covering a wide range of standard pitches give complete tooth dimensions for any diametral or circular pitch, including full-depth teeth and three stub-tooth standards. In addition, there is a table of standard (DIN) modules with equivalent diametral and circular pitches, as well as the important tooth dimensions.

The dimension, angle, or quantity represented by letters used in the formulas, or the notation, will be found at the beginning of the book, and the same notation is applied to all classes of gearing, so that there is never any doubt as to the meaning of a given letter or symbol. The following list of section headings indicates the general scope of this new book: Gear-Tooth Standards; Spur Gears—Full-Depth Teeth; Spur Gears—Stub Teeth; Internal Gearing; Bevel Gears for Right-Angle Drives; Bevel Gears—Angular Drives; Straight-Tooth Bevel Gears—Gleason System; Spiral Bevel Gears—Gleason System; Bevel Gears of Parallel-Depth Type; Helical Gears; Herringbone Gears; Worm-Gearing; Worm-Gearing—Module System; Gearing Ratios and Speeds; and Power-Transmitting Capacity of Gearing.

James F. Lincoln Arc Welding Foundation

At a recent meeting of the board of directors of the Lincoln Electric Co., Cleveland, Ohio, a foundation named "The James F. Lincoln Arc Welding Foundation" was established in honor of the pioneer work of James F. Lincoln, president of the Lincoln Electric Co., whose work in promoting arc welding and in developing arc welding equipment and electrodes is well known throughout industry. The new Foundation is dedicated to the encouragement of study and research for the benefit of the arc welding industry. One of its primary functions will be the stimulation of original design, in order that arc welding may be more widely utilized in present-day fabrication processes.



James F. Lincoln, President of the Lincoln Electric Co., in whose Honor the Foundation has been Established

Dr. E. E. Dreese, Head of Department of Electrical Engineering, Ohio State University, who will Direct Foundation

Dr. E. E. Dreese, head of the department of electrical engineering of the Ohio State University, will have the principal direction of the Foundation's work. Dr. Dreese is an outstanding member of the American Institute of Electrical Engineers and is well known in the field of general science.

The work of the Foundation in stimulating scientists, engineers, and skilled workers to extend the frontiers of knowledge and achievement of the welding field will result, it is believed, in lower production costs of a great number of devices and commodities throughout all industries.

The position that welding has made for itself as a manufacturing and fabrication process makes it particularly fitting that its advance should be fostered by an agency without commercial interests, the work of which is wholly directed from engineering and scientific points of view.

More Practical Training in Engineering Schools

By J. HOMEWOOD

The average engineering graduate, particularly the one who becomes engaged in manufacturing, finds that his training does not carry him very far in the manufacturing plant until he has received a further degree, obtained rather painfully, and incidentally, at considerable cost to his employer. He is bound to make mistakes, but he will learn. The cost of this learning period in industry is repaid to the employer when the young man finds himself able to coordinate his technical information with practical knowledge. The question I wish to ask is: Could not this learning period be considerably shortened if engineering schools would give to their courses a more practical leaning?

If I may be so bold, I would like to suggest a change in the courses of study—I would eliminate some time-consuming subjects of less relative value in practical engineering, and substitute some real factory work, as is being done by a few engineering schools. I would have the student spend some of his time in an up-to-date drafting-room, where he would learn to draw for practical purposes and with a view to industrial efficiency. I would like to see him able to make a well executed drawing, easily understood by patternmaker and machinist. In the drafting-room, he will become acquainted with the thousand and one details in manufacturing procedure.

I would put him under the guidance of a good patternmaker, so that he might get some pointers on how to design parts properly to be cast in the foundry. I would let him have a session with the molders in the foundry, and also let him absorb some of the atmosphere of the machine shop, so as to gain a general acquaintance with the tools of production. In operating machine tools, the important thing is that he should get the machinist's viewpoint, and his experience should include some first-hand knowledge of the behavior of various metals and the meaning of various fits and finishes. A little knowledge of heat-treating methods would do no harm.

With such a basis for his engineering education, he would be able to deal intelligently with the processes through which a design must pass. I have heard that some mechanical engineering courses in European engineering schools require the high-school graduate to serve a certain length of time in a machine shop before he is permitted to start on his engineering course.

Increase in Production Capacity of Machine Tools in Ten Years

Additional Examples of the Increased Output and the Greater Accuracy Made Possible by Machine Tool Developments in the Last Ten Years

IN January MACHINERY, page 325, a number of examples were recorded of the effect of recent machine tool developments on increased output, higher finish, and greater accuracy. In the following paragraphs some additional examples will be quoted.

Gear-cutting practice has advanced remarkably during the last decade. To illustrate this, the Gleason Works furnish the following information: Taking a bevel gear conforming to average automobile specifications, say 4.5 diametral pitch, 41 teeth, and 1 1/2-inch face length, we find that it was considered very satisfactory to produce such a gear on the old design of Gleason 15-inch spiral-bevel gear rougher in 15 seconds per tooth, with 0.7 minute allowed for changing from gear to gear, or a total floor-to-floor time of 11 minutes. The total production, making necessary allowances, would average 4 1/2 gears per hour per machine.

On the new Gleason No. 11 spiral-bevel and hypoid gear rougher, the time per tooth is 5.7 seconds, with 0.3 minute allowed for changing time, or a total floor-to-floor time of 4.2 minutes. Regular production would average 12 pieces per hour per machine.

Besides the advantage of more rapid production, the new machine has a chamfering attachment which removes the sharp corner at the acute-angled ends of the gear teeth, thus eliminating a separate operation required on the older machine.

The preceding paragraphs relate to roughing the *gears* of a pair. Referring now to the *pinion*, we find that a nine-tooth pinion, of 4 1/2 diametral pitch and 1 1/2-inch face length, could be roughed on the older machine at the rate of 7 pieces per machine per hour, while the production on the new machine is 25 pieces per hour.

Considering again the gear of 41 teeth, 4.5 diametral pitch, and 1 1/2-inch face length, the old 15-inch spiral and hypoid generator required a total floor-to-floor time for finish-cutting the teeth of 30.5 minutes per gear, a production of less than 2 gears per hour. On the new No. 11 Gleason "formate" single-cycle gear-finishing machine, the floor-to-floor time is 4.5 minutes, or a production of 12 gears per hour.

The so-called "formate" gears may also be finished by a grinding operation after the gears have been heat-treated on a No. 14 formate spiral-bevel gear grinding machine. In this way, any heat-treatment deformation is entirely eliminated. There was no machine comparable to this ten years ago, since the formate gear grinding machine is a new contribution to gear manufacturing procedure; the speed of finishing gears by grinding is, however, considerably greater than that of finishing them on the old 15-inch spiral-bevel gear generator. The new machine will finish a gear, using three passes of the grinding wheel, at a regular production rate of 6 gears per hour.

On the subject of tool grinding, the Cincinnati Milling Machine and Cincinnati Grinders, Inc., informs us that a Cincinnati No. 2 cutter and tool grinder will perform its work, on an average, 25 per cent faster than the machine sold by the company for the same type of work ten years ago.

As an example of improvements in regular milling speeds, it is mentioned that the Cincinnati No. 3 universal high-speed dial type milling machine is anywhere from 25 to 40 per cent faster than the corresponding size of machine sold ten years ago, due to a combination of higher spindle speeds, increased rigidity, greater power, and means for faster handling and quicker set-up.

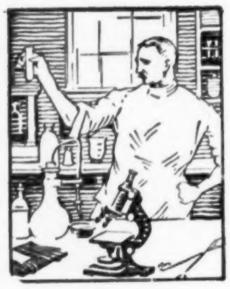
* * *

Reducing Labor Turnover

By JOHN A. HONEGGER

Now that business is beginning to show considerable activity again, superintendents and foremen should give thought to reducing labor turnover in the various departments. The right amount of money in the pay envelope is, of course, of primary importance; but, in addition, labor turnover can be greatly reduced by clean shops, good light, good ventilation in the summer and proper heating in the winter, equipment maintained in good condition, and the necessary supplies. Safe working conditions and sensible shop rules have a great deal to do with labor turnover; and last but not least, the feeling that there is an attempt on the part of supervisors and management to give their men "a square deal."

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Oxidation of Zinc Die-Castings Inhibited by Dip

If zinc die-castings are dipped in certain solutions of alkali chromates or dichromates, oxidation of their surfaces will be inhibited. The New Jersey Zinc Co., 160 Front St., New York City, has developed for this purpose an aqueous solution of sodium or potassium dichromate with a small amount of sulphuric acid added. The film formed by dipping zinc die-castings into this solution for a period of from ten to fifteen seconds will resist any attack of moisture as long as the film remains.

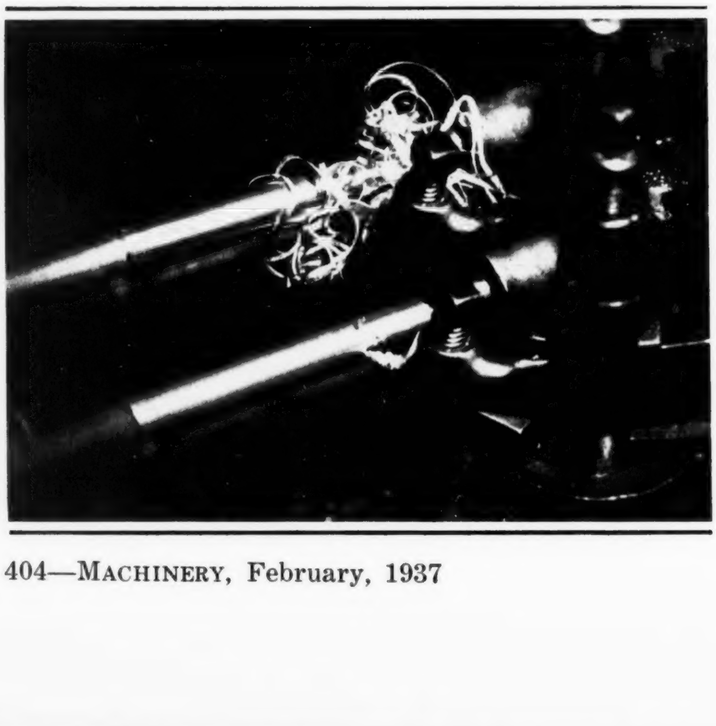
Flexible Resins for Impregnating, Coating and Bonding

A phenolic resin that combines the bonding strength, resistance to water, acid, and alkali, and friction resistance of conventional resins with a high degree of flexibility has recently been developed by General Plastics, Inc., North Tonawanda, N. Y. These new Durez resins are used for impregnating fabrics, woven belting, brake lining, etc. They are so flexible that a fabric impregnated with them can be sharply creased repeatedly without sign of fracture, and aging does not change this quality.

Flexible abrasive cloth and waterproof sandpaper treated with these resins show unusual water and oil resistance, while brake linings of the woven type that have been similarly treated give long wear and a uniformly stable coefficient of friction.

What Materials are Most Suitable for Worm-Gears?

Some time ago, Chester B. Hamilton, Jr., president of the Hamilton Gear & Machine Co., Toronto, Canada, conducted an extensive series of tests on a variety of materials that might be used for worm-gears, with a view to ascertaining which material is the most suitable. Mr. Hamilton found that chill-cast nickel-phosphor-bronze ranks first in resistance to wear and deformation. This bronze is composed of approximately 87.5 per cent copper, 11 per cent tin, 1.5 per cent nickel, with from 0.1 to 0.2 per cent phosphorus. The worms used in these tests were made from S A E-2315, 3 1/2-per cent nickel steel, casehardened, ground, and polished. The Shore scleroscope hardness of the worms was between 80 and 90. This nickel alloy



The Chips Obtained in Turning a Free-cutting Aluminum Alloy are an Indication of its Quality. Fine Well-broken Chips, such as Seen in the Foreground of the Illustration, Indicate a Free-cutting Aluminum Alloy of High Quality, while Long Stringy Chips, such as Seen in the Background, are Produced from a Non-free-cutting Aluminum Alloy

steel was adopted after numerous tests of a variety of steels, because it provided the necessary strength, together with the degree of hardness required.

The material that showed up second best in these tests was a No. 65 S A E bronze. Navy bronze (88-10-2) containing 2 per cent of zinc, with no phosphorus, and not chilled, performed satisfactorily at speeds of 600 revolutions per minute, but was not sufficiently strong at lower speeds. Red brass (85-5-5) proved slightly better at from 1500 to 1800 revolutions per minute, but would bend at lower speeds, before it would show actual wear.

"Toughened" Glass Possesses Remarkable Strength

Glass is now being manufactured having qualities never expected a few years ago. The Triplex Safety Glass Co., Ltd., of Birmingham, England, makes a product known as "toughened glass," which looks exactly like ordinary plate-glass but does not act as glass usually does. According to *Industrial Britain*, a piece of this glass can be thrown on the floor, hit with a hammer, jumped on with hobnailed boots, and yet will neither break nor show a fracture; but, like all other materials, there is a limit to its resistance, and tests have been made to determine what this limit is.

As the glass passes through the process of making, every pane receives a blow from a mechanical hammer equivalent to the impact of a steel ball weighing 1.68 pounds dropping from a height of 5 feet. In testing the glass to the endurance limit, it is placed in a machine where an actual steel ball of the weight mentioned is dropped from increasing heights until, when dropped from a height of about 9 feet, it will cause the glass to fracture. Ordinary plate-glass of the same thickness breaks when the ball is dropped from a height of one foot.

In another test, a full-sized ivory billiard ball was dropped on a sheet of glass from a height of 32 feet without breaking the glass. As a matter of fact, the glass was unmarked, but the billiard ball showed flat "scars."

Galvanized Sheets that Can be Painted Without Special Treatment

Galvanized sheet metal that can be painted without requiring special treatment has been announced by the American Rolling Mill Co., Middletown, Ohio. These "Paintgrip" sheets have a special insulating coating which prevents the paint from coming into direct contact with the zinc surfaces. The result is a galvanized metal that has a good surface for adhesion plus a chemical neutrality that retards aging of the paint. The "Paintgrip" treatment is available in any of the grades of galvanized sheets manufactured by the concern. Two surface finishes, regular and extra smooth, are available.

Monel Casters Supplied on Trucks Used in Chemical Plants

Trucks and similar equipment used in plants where acids, alkalies, and other corrosive agents are utilized can now be equipped with casters, the metal parts of which are made entirely from Monel metal, including the bearings, shaft, and spacers. The wheels themselves are of a special rubber composition. Casters of this type are manufactured by the Bassick Co., Bridgeport, Conn. They are available in both stationary and swivel-roller types and are adapted for use in chemical plants, laundries, dry-cleaning establishments, etc.

An Electric Range Timer Made by the Lux Clock Co. from Molded Durez Simplifies the Internal Insulation Problem and Reduces the Danger of Electric Shock. Furthermore, the Durez Surface Resists Fluid Acids, Grease, etc. The "Wings" on the Sides are Salt and Pepper Shakers Made from Durez in a Matching Design

Fig. 1. Machine in which More than Twenty Die-castings are Used Both for Decorative and Operating Purposes

Fig. 2. Small Die-castings, the Larger of which Weighs Only 0.14 Ounce and Has a Wall Thickness of 0.023 Inch

New Products Show Versatility of Die-Casting Process

THE facility with which parts of intricate shape can be produced by a single die-casting operation has made possible the development of many new products. The Addressograph shown in Fig. 1, in which more than twenty zinc alloy die-castings are assembled, is a typical example. The decorative value of die-castings has been utilized in the design of the escutcheons and the case bearing the name-plate of this machine; but the most important application of die-casting in the construction of this machine is in the parts of the operating mechanism.

One of the die-castings used in the mechanism has a gear segment, as shown in Fig. 3, in which the teeth are die-cast. It would be practically impossible to make this part as one piece by any process other than die-casting. The strength of the thin wall sections of the die-castings used in the parts of the Addressograph made it possible to employ more compact mechanisms throughout the entire machine.

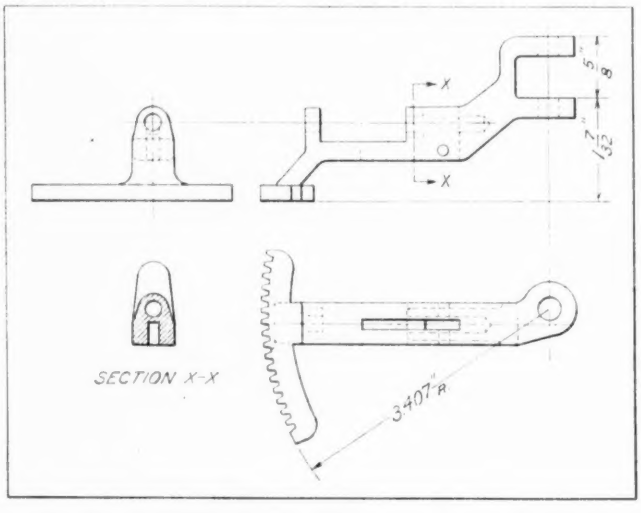


Fig. 3. One of the Intricate Die-castings Assembled in Mechanism of Machine Shown in Fig. 1

The present scope of die-casting operations ranges all the way from the tiny head of an Otoscope, a surgical instrument, shown in Fig. 2, which weighs 0.14 ounce, to the large die-castings now being used for automobile radiator grilles. If it were not die-cast, the larger of the two parts shown in Fig. 2 would have to be made as an assembly of at least three intricate parts.

NEW TRADE  LITERATURE

Oxygen Cutting Equipment

THE LINDE AIR PRODUCTS CO., Unit of Union Carbide and Carbon Corporation, 205 E. 42nd St., New York City. Booklet containing information on the oxygen lance—what it is, how it is used, and what it will do. Typical operations performed with this equipment are illustrated by photographs and diagrams, indicating the scope of application of the oxygen lance in the steel industry for cutting heavy masses of metal, and as a regular production tool in piercing small holes and cutting large sections to shape.

Silent Chain Drives

LINK-BELT CO., 519 N. Holmes Ave., Indianapolis, Ind. Data Book 125, on Link-Belt Silverstreak silent chain drives ranging from fractional horsepower up to 2000 horsepower. The contents include installation pictures; engineering data; recommended drive selection; lubrication and casings; dimensions of chains and parts; list prices of chains and wheels; dimensions of wheel rims, hub sizes, bores, and keys; chain adjusters; breaking pin hubs; bronze bushings; positive drives; electrical data, etc.

Zinc Metals and Alloys

NEW JERSEY ZINC CO., 160 Front St., New York City. Booklet entitled "Zinc Metals and Alloys," containing brief information concerning all of this company's zinc products except rolled zinc. A large section of the book is devoted to Zamak alloys for die-castings, and in this section are included figures on physical properties, dimensional stability, corrosion resistance, A.S.T.M. specifications, etc.

Power Transmission Equipment

T. B. WOOD'S SONS CO., Chambersburg, Pa. Circular entitled "New Power Economy with Wood's Group Drive Equipment," illustrating various examples of the power transmission equipment made by this concern, which includes shafting, hangers, pulleys, friction clutches,

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies can be Obtained by Writing Directly to the Manufacturer.

flexible couplings, sheaves, pillow blocks, ball bearings, V-belt drives, belt contactors, etc.

Sprayed Molten-Metal Coating Process

METALS COATING CO. OF AMERICA, 495-497 N. Third St., Philadelphia, Pa. Folder 1206, entitled "Meta-LayeR, Complete Metal Coating Process," containing photographs showing typical parts subjected to the sprayed molten-metal coating process, both for maintenance and production. A description of the process and equipment is included.

Welding Equipment

LINCOLN ELECTRIC CO., Cleveland, Ohio. Welder Specification Bulletin 315, illustrating and describing Lincoln "Shield-Arc SAE" alternating-current welder of 200, 300, 400 and 600 amperes. Bulletin 316, descriptive of the Lincoln "Shield-Arc SAE" direct-current welder, of the same amperages.

Mechanical Rubber Products

DIAMOND MECHANICAL DIVISION of the B. F. Goodrich Co., Akron, Ohio. "A Buyer's Guide to Diamond Mechanical Rubber Goods," containing illustrations and descriptions of over fifty mechanical rubber products and accessories, such as transmission and conveyor belting, hose and fittings, tubing, packing, etc.

Power Tools

WALKER-TURNER CO., INC., 1817 Berckman St., Plainfield, N. J. Catalogue G-7, descriptive of the complete line of Driver power tools made by this company, which includes lathes, jig saws, drill presses, shapers, surfacers, grinders, jointers, flexible shafts, transmission equipment, etc.

Die-Heads

GEOMETRIC TOOL CO., New Haven, Conn. Bulletin EJ4-1, illustrating and describing a small Geometric solid adjustable die-head, which is only 1 inch in diameter and weighs but 3 ounces. Two styles of this tool are described, one with a plain shank, and the other with a threaded back part.

Cap-Screws

BRISTOL CO., Waterbury, Conn. Data sheet, giving complete information on Bristo socket-set and socket-head cap-screws, as approved by the American Standards Association, February, 1936. Data is also included on Bristo socket-head stripper bolts and pipe plugs.

Flexible Metal Hose

ECLIPSE AVIATION CORPORATION, Subsidiary of Bendix Aviation Corporation, 545 N. Arlington Ave., East Orange, N. J. Bulletin H-201, containing data on Eclipse seamless flexible metal hose, suitable for application in the automotive and other industries.

Bonderizing Process

PARKER RUST-PROOF CO., 2177 E. Milwaukee Ave., Detroit, Mich. Circular outlining the advantages of the "Dip-Spra" Bonderizing Process for applying a corrosion-resisting paint base to iron, steel, galvanized, zinc alloy, or cadmium surfaces.

Broaching Machines

COLONIAL BROACH CO., Detroit, Mich. Bulletins 104-9C and 104-9F, illustrating and describing Colonial dual-ram surface broaching machines, and Colonial power presses for heavy-duty broaching, respectively.

Pillow Blocks

RANDALL GRAPHITE PRODUCTS CORPORATION, 609-613 W. Lake St., Chicago, Ill. Catalogue containing complete specifications and installation data on six types of pillow blocks, including a new universal-position model.

Cold-Drawn Steels

UNION DRAWN STEEL Co., Massillon, Ohio. Circular advertising Union cold-drawn carbon and alloy steels in rounds, squares, flats, hexagons, and special shapes, as well as other cold-finished products.

Chains and Sprockets

BALDWIN-DUCKWORTH CHAIN CORPORATION, Springfield, Mass. Catalogue L, containing complete data on Baldwin-Duckworth chains and sprockets for power transmission, conveying, and elevating purposes.

Speed Reducers

UNIVERSAL GEAR CORPORATION, Indianapolis, Ind. Circular illustrating various applications of the speed reducers made by this concern, such as drives for pressure lubricators, belt conveyors, rolling mills, etc.

Shearing Machines

CANTON FOUNDRY & MACHINE Co., 6400 Breakwater Ave., Cleveland, Ohio. Circular illustrating and describing the new Canton streamline all-steel shears, designed for increased strength and power.

Knife Grinders

SAMUEL C. ROGERS & Co., 191-205 Dutton Ave., Buffalo, N.Y. Circulars descriptive of the Rogers Type F automatic knife grinder; Type W reversible knife grinder; and Type CC circular knife grinder.

Research Metallographic Equipment

BAUSCH & LOMB OPTICAL Co., Rochester, N. Y. Bulletin E-240, descriptive of the new Bausch & Lomb research metallographic equipment for visual and photographic work.

Threading and Welding Equipment

OSTER MFG. Co., 2057 E. 61st Place, Cleveland, Ohio. Catalogue covering the complete line of Oster-Williams pipe and bolt threading equipment and welding equipment.

Heat-Treating Equipment

LEEDS & NORTHRUP Co., 4921 Stenton Ave., Philadelphia, Pa. Folder 621A, containing information on the hardening of jewelry dies by the use of the triple control Hump-Vapocarb method.

Agitating and Mixing Equipment

PATTERSON FOUNDRY & MACHINE Co., East Liverpool, Ohio. Catalogue covering this company's line of agitating and mixing equipment for the process industries.

Diesel Engines

FAIRBANKS, MORSE & Co., 900 S. Wabash Ave., Chicago, Ill. Booklet entitled "Fairbanks-Morse Diesels," illustrating and describing the line of Diesel engines made by this concern.

Electric Furnaces

H. O. SWOBODA, INC., 4301 Main St., Pittsburgh, Pa. Circular 258, illustrating and describing the Falcon high-temperature electric muffle furnace for heat-treating dies, tools, etc.

Chain Drives and Conveyors

CHAIN BELT Co., Milwaukee, Wis. Bulletins 291, 292, and 293, descriptive of Rex roller chain, Griplock chain, and Z-metal chains, respectively, for drives and conveyors.

Combustion Tube Furnaces

HEVI DUTY ELECTRIC Co., Milwaukee, Wis. Bulletin HD-1236, descriptive of the construction and uses of this company's line of combustion tube furnaces.

Lighting Equipment

FOSTORIA PRESSED STEEL CORPORATION, Fostoria, Ohio. Circular descriptive of a very small lamp assembly for application on machines where space is limited.

Power Pumps

FAIRBANKS, MORSE & Co., 900 S. Wabash Ave., Chicago, Ill. Bulletin 6160, describing the characteristics and applications of Fairbanks-Morse duplex power pumps.

Socket Screws

HOLO-KROME SCREW CORPORATION, Hartford, Conn. Catalogue containing data and illustrations covering the line of Holo-Krome Fibro forged socket screws.

Oil-Testing Instruments

C. J. TAGLIABUE MFG. Co., Park and Nostrand Aves., Brooklyn, N. Y. Catalogue 699D, on Tag oil-testing instruments for petroleum products.

Electric Motors

CENTURY ELECTRIC Co., 1806 Pine St., St. Louis, Mo. Bulletin on Century single-phase motors of the repulsion-start induction type.

Steel Belt Lacing

BRISTOL Co., Mill Supply Division, Waterbury, Conn. Bulletin 725, giving prices, sizes, etc., of Bristol steel belt lacing.

Flexible Couplings

BOSTON GEAR WORKS, INC., North Quincy, Mass. Leaflet descriptive of a new FCB flexible coupling of the ball bearing type.

Blowers

ALLIS-CHALMERS MFG. Co., Milwaukee, Wis. Leaflet 2236, entitled "Turbo Blowers for the Steel Industry."

Drawing Compounds

SWAN-FINCH OIL CORPORATION, 205 E. 42nd St., New York City. Folder on Safco drawing compounds.

* * *

Nine Bearings Burned Because Someone Forgot Something

The following experience from a lumber mill in Arkansas is told by M. D. Bush, of the Standard Oil Co. of Louisiana, in *Esso Oil-Ways*. An edger machine had burned out nine of its water-cooled babbitt bearings in two days, when a lubrication engineer was called in to help solve the problem. When he arrived, he found a man pouring oil on a smoking bearing, but still it persisted in running hot. The engineer concluded that he was attacking the effect rather than the cause, and he set out to find the cause.

After checking everything else, he traced the water-line that fed the water-cooled bearings. He discovered that the valves of the line had been turned off two days before when some repair work was being done, and the repair men had forgotten to turn them on again.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

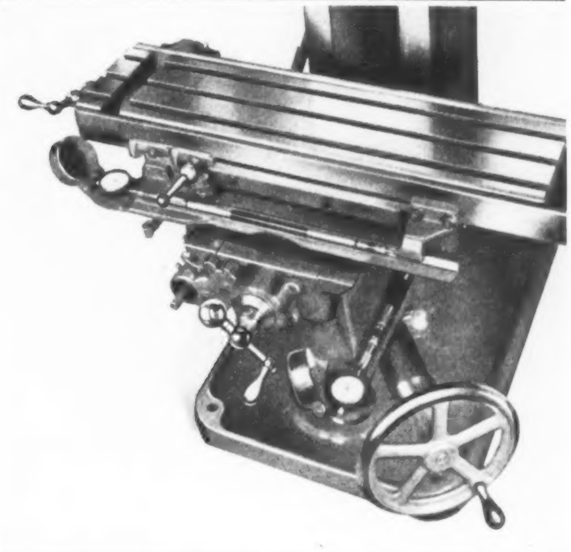


Fig. 1. Close-up View, Showing Precision Gages for Setting Table of Cochrane-Bly Miller-Shaper

Cochrane-Bly Universal Vertical Miller-Shaper

A high-speed spindle mounted in anti-friction bearings, precision gages for setting the table for boring operations, and a radius tool attachment for the shaper ram are features of the improved Cobly Universal vertical miller-shaper, recently placed on the market by the Cochrane-Bly Co., Rochester, N. Y. The spindle is equipped with a sleeve which holds split collets in sizes ranging from 1/8 to 5/8 inch. It has ten speeds, the maximum speed being about 2100 revolutions per minute, thus eliminating the need for a high-speed attachment. The spindle can be furnished either with or without a power down feed, having four changes which are applicable to any spindle speed. The feed has an automatic stop and a micrometer screw for gaging the depth.

A close-up view of the table, Fig. 1, shows the Pratt & Whitney system of end gages, micrometers, and dial gages reading to 0.0001 inch, which is used for setting the table accurately for boring holes in dies, jigs, gages, fixtures, molds, etc., as well as for milling and shaping operations.

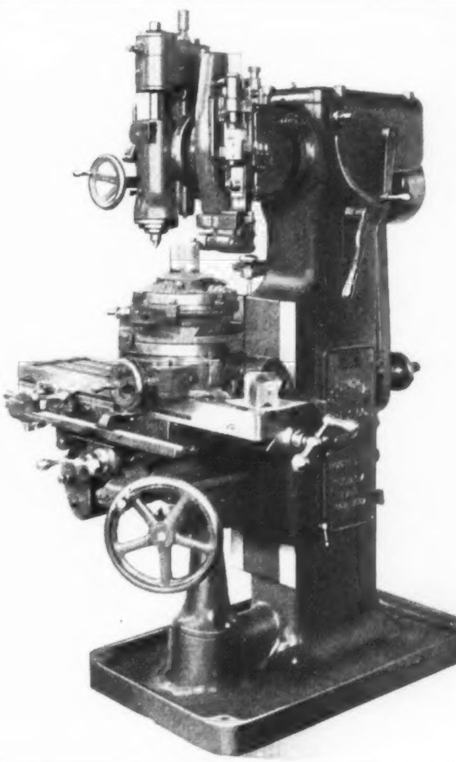


Fig. 2. Cochrane-Bly Improved Type Miller-shaper

The radius tool attachment fits the shaper ram in place of the clapper-block, and can be used to shape punches from the rough without under-cutting. A punch located on the compound circular table (Fig. 2) can be machined on all sides from any center within a 5-inch circle, developing true radii. Tangent and angular cuts can also be taken with a high degree of accuracy. The table settings can be duplicated when machining the die opening with the regular tool-holder. The accuracy thus obtained results

in a considerable saving of transfer and set-up time on dies and punches and eliminates the necessity for many filing and fitting operations.

The milling and shaping heads can be adjusted to any angle, right to left or left to right, from the vertical to the horizontal position, and 45 degrees front and back from the center for drilling, milling, boring, shaping, and slotting operations. Constant power feed is provided for milling, and there is an intermittent feed for shaping operations. Power feeds are also available for longitudinal, transverse, and circular table movements. The table can be arranged to receive a 10-inch universal dividing head, as shown in Fig. 3. Spiral gears, milling cutters, and a wide variety of other work that can be mounted on centers can be machined.

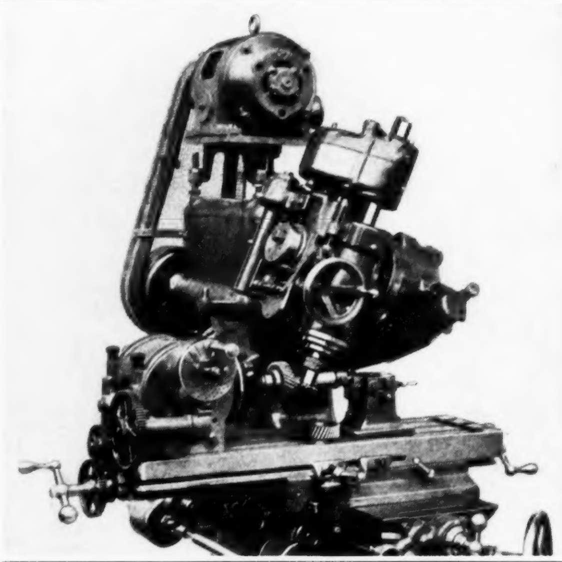


Fig. 3. Miller-Shaper with Dividing Head Set up for Cutting Spiral Gears

Reed-Prentice Die-Casting Machines

The Reed-Prentice Corporation, Worcester, Mass., is now building a No. 8G brass alloy die-casting machine which differs somewhat in appearance from the machine illustrated and described in February, 1936, MACHINERY, page 409. This machine is semi-automatic in operation. The operator first throws a lever to close the dies and cores. He then ladles the material into the metal cylinder and steps on the plunger pedal, forcing the metal into the dies. From then on, the cycle is automatic.

The first timing period determines the time to pull the cores, and the second period allows time for cooling before opening the dies. The third period allows the plunger to follow the moving die, forcing the metal slug out of the cylinder before it returns. The casting is ejected from the moving die at the end of its return stroke.

The machine has an Oilgear pump, with special control which reduces the maximum pump delivery from 44.6 to 22 gallons per minute, when the line pressure reaches 1000 pounds per square inch, and maintains the reduced delivery volume until the line pressure reaches 2000 pounds per square inch, when the stroke is reduced to such a point as will maintain a pressure of 2000 pounds per square inch.

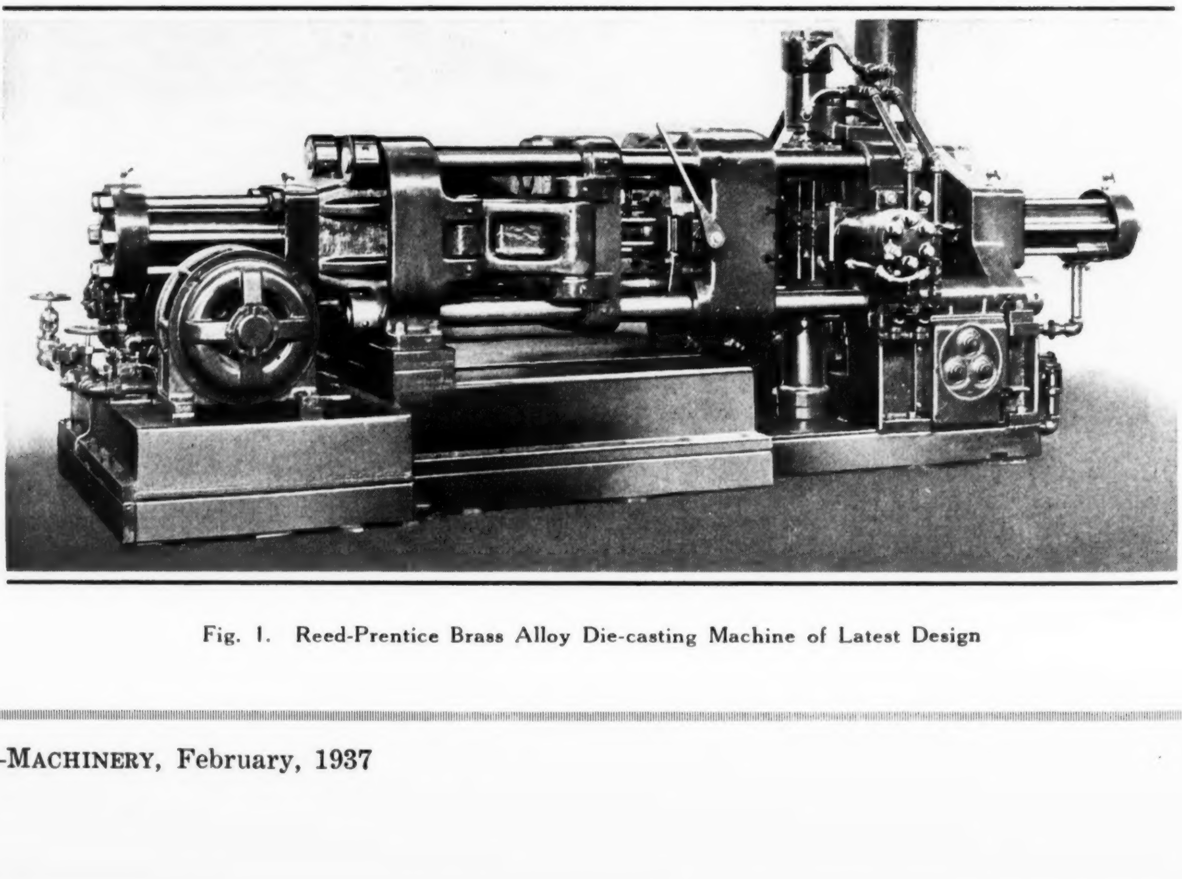


Fig. 1. Reed-Prentice Brass Alloy Die-casting Machine of Latest Design

A nitrogen bottle is furnished which acts as an accumulator and enables the plunger to be operated at a fast speed. The nitrogen bottle is charged with nitrogen at a pressure of 1000 pounds per square inch. Oil is pumped into the bottle until the pressure reaches 2000 pounds per square inch. The oil released on the forward stroke of the plunger is replenished and the pressure of 2000 pounds per square inch is maintained during the idle cycle of the machine. The company also makes smaller machines known as the Nos. 1G, 1 1/2G, and 2G types.

The same concern has also recently developed the No. 1 1/2 fully hydraulic machine of the design shown in Fig. 2 for the die-casting of molten zinc alloys. Two levers control the complete operation, and they are interlocked, so that it is impossible to operate the plunger cylinder until the dies are securely locked. A safety pilot-valve mechanism eliminates the danger of shooting metal when the dies are open. Automatic ejection of castings is provided for. The die plates are finished on all four sides to permit the application of core pulling attachments. Accessibility of the plunger, gooseneck, and melting pot is an important design feature of this

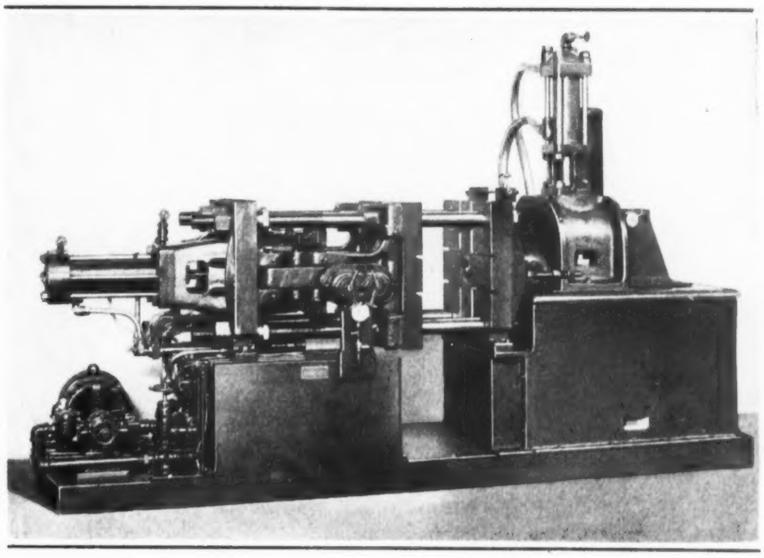


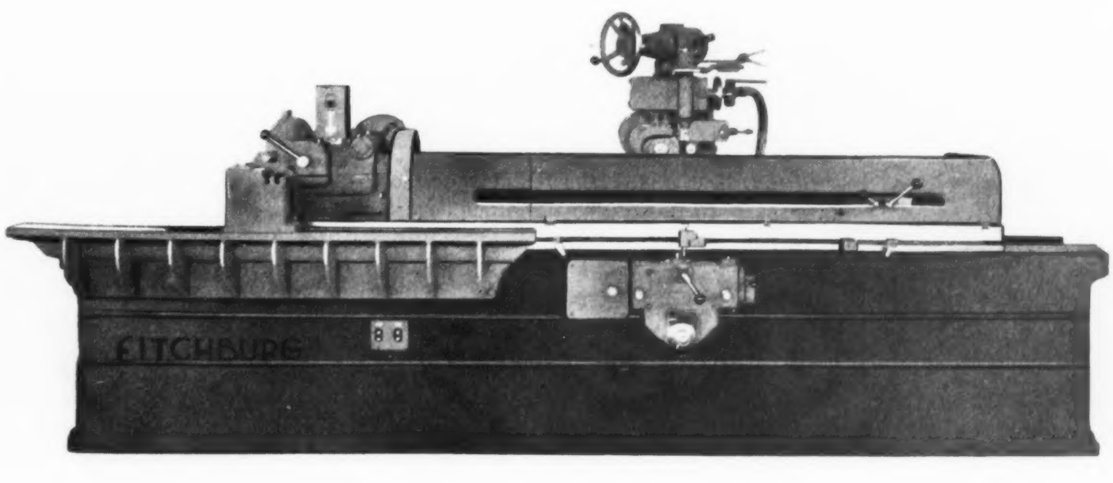
Fig. 2. Zinc Die-casting Machine of Recent Reed-Prentice Design

equipment. These units can be removed without dismantling the cylinder mechanism.

Important specifications of this machine are as follows: Approximate size of die plates, 28 by 29 inches; capacity of melting pot, 700 pounds of zinc; space between bars, 13 by 18 inches; minimum die space, 6 inches; maximum die space, 18 inches; locking pressure, 50 tons; and estimated number of "shots" per hour, 400.

Fitchburg 60-Inch Spline-Shaft Grinder

Shafts up to 60 inches long can be accommodated between the centers of a spline-shaft grinding machine recently developed by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass., when the machine is equipped with a table type



Fitchburg Spline-shaft Grinding Machine with Table Type Wheel-truing Device

truing device, and work up to 72 inches long when the truing device is mounted on the wheel-head. Other specifications of this machine are the same as those of the previous model, which was described in the February, 1936, number of MACHINERY, page 417.

The table type W-form truing device is mounted on the table just in back of the footstock. It is adjustable for diamond height, so that the W-form produced on the wheel coincides with the finished size of the splines after grinding.

This table type truing device is not so universal as the wheel-head type provided on the previous model, in that it cannot be adjusted for as wide a range of shaft and spline sizes. It is more suitable for production work, however, and is a faster operating mechanism, due to the fact that it has three diamonds which are actuated through eccentric rods. By turning one handwheel, the three diamonds are moved alternately for trimming the angular sides and bottom radius of the grinding wheel.

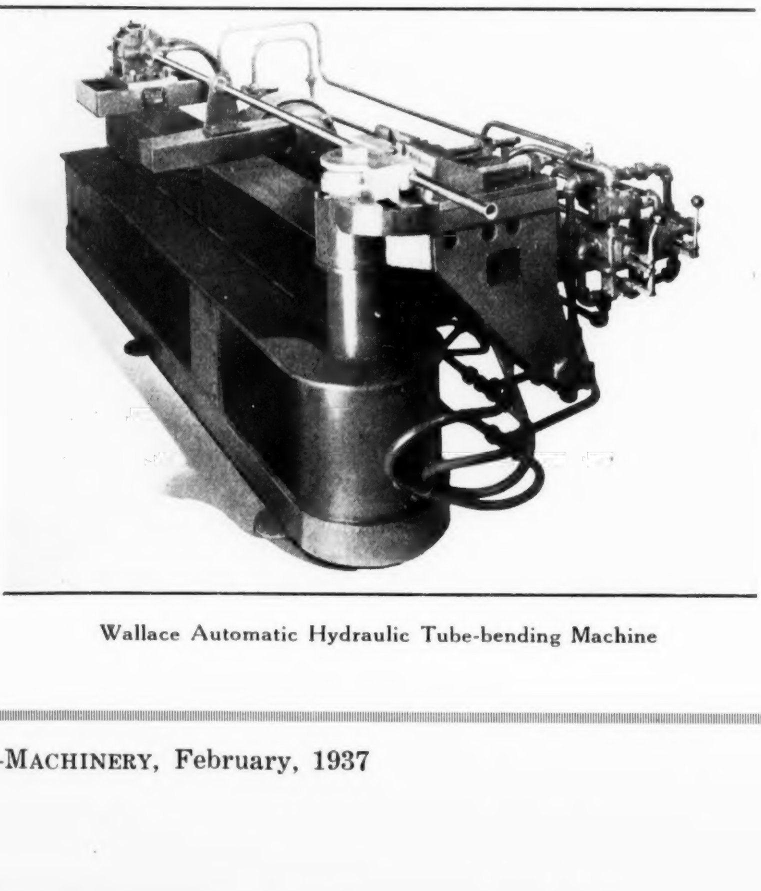
An automatic hydraulic-ratchet down feed may be applied to any of the spline-shaft grinders built by the concern. With this mechanism, the amount of feed can be regulated and the machine can be set to make the number of table strokes required for finishing all of the splines on a shaft.

Wallace Hydraulic Tube-Bending Machine

A hydraulic tube-bending machine having a capacity for bending tubes with outside diameters up to 2 1/2 inches to a maximum radius of 12 inches and to a minimum radius equal to twice the outside diameter in sizes over 1 1/8 inches, has been brought out by the Wallace Supplies Mfg. Co., 1310-12 Diversey Parkway, Chicago, Ill. This machine, designated as No. 445, incorporates all the latest improvements, is fully automatic and simple to operate. A single hand-lever controls the forward cycle and all subsequent operations up to and including the unloading of the machine. A foot-operated valve is employed for returning the bending arm to its original position.

The tube is placed on the mandrel against a stop. The hand-lever is then pressed toward the machine and automatically locked in place. This movement of the lever starts the automatic cycle. After the bending arm has rotated to a predetermined point, the hand-lever is automatically released from its locked position, thus completing the first half of the bending cycle. The operator then pulls the released hand-lever away from the machine, or in the opposite direction required for the first half of the cycle. This automatically withdraws the mandrel, releases the clamp and the pressure block, thus completing the final half of the bending cycle, leaving the work ready to be removed.

After extracting the bent tube, the operator simply steps back about a foot and a half and presses a foot-lever which returns the bending arm to its original position. The foot valve allows the operator to have free use of both hands, permitting him to check the bent pieces while the bending arm is returning, or to procure a straight tube for the successive bending operation.



Wallace Automatic Hydraulic Tube-bending Machine

Improved Steel in Billings & Spencer Strap Clamps

The well-known adjustable strap clamps that have been made for many years by the Billings & Spencer Co., Hartford, Conn., and that have previously been illustrated and described in the technical press, have been greatly improved through the use of a superior grade of steel which has had the effect of increasing the strength of the clamps approximately 25 per cent.

These clamps are available in three sizes, with over-all lengths of 5, 8, and 12 inches. They can be used for securing work on planers, boring mills, drilling machines, lathe faceplates, milling machines, and any other types of machine tools where secure clamping is required. The elongated slot in these clamps makes it possible to adjust them for handling a wide variety of work of various heights.

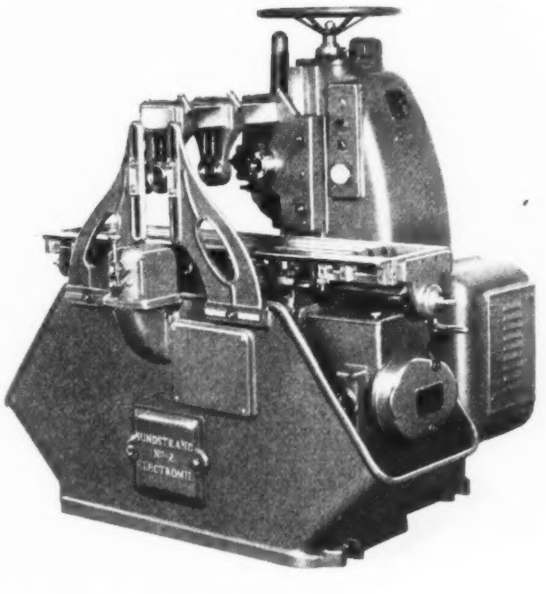


Fig. 1. Sundstrand Electromil Designed for High-speed Milling of Small Parts

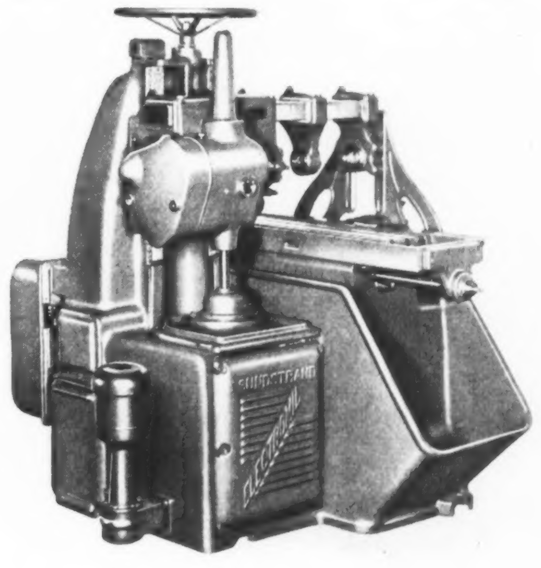


Fig. 2. Electromil Shown in Fig. 1, as Viewed from Rear and Left-hand Side

Sundstrand Automatic Electromil

An electrically controlled Rigidmil designed for high-speed economical operation on small parts requiring highly accurate milling operations has been brought out by the Sundstrand Machine Tool Co., 2530 Eleventh St., Rockford, Ill. This machine is known as the No. 2 Electromil. It is essentially a small type Rigidmil with automatic electric table-control for high-speed milling of small machine parts, household appliances, electrical apparatus, tools, etc.

Simple fixtures which can be set up or changed very quickly from one job to another may be employed to reduce milling costs on parts manufactured in small quantities, thus obtaining the economy of a special machine without requiring a large investment in tools or fixtures. Convenience in setting up and the simple tool equipment required, combined with high-speed automatic operation, adapt the machine for continuous operation on long-run work.

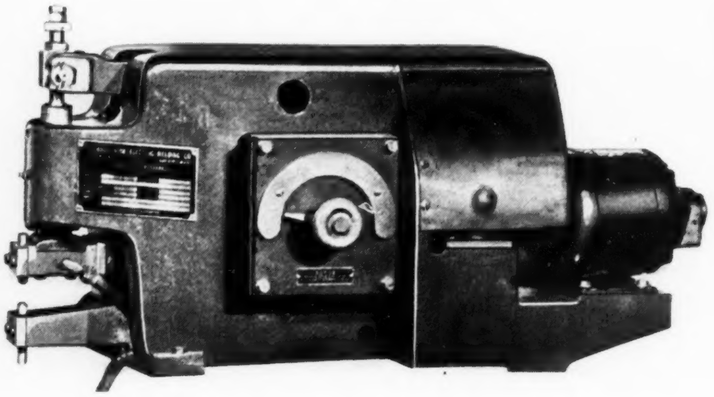
The machine has a patented rectangular over-arm and an adjustable spindle head. The support for the arbor and spindle and the anti-backlash arrangement are so designed that "climb" milling is accomplished as effectively as conventional milling. One or both of these types of milling can be used. For example, "climb" milling can be performed by feeding the table to the right, while conventional milling is performed by feeding the table to the left, the work being held in a double fixture and the spindle running counter-clockwise. Either "climb" or conventional milling can also be performed at both ends of the table, using two cutters, two fixtures, and the automatic spindle reverse.

A single lever provides manual control of all table movements for setting-up purposes. The automatic operating cycle is obtained by setting easily adjusted dogs under a guard rail on the front edge of the table. These dogs are made in six different types for controlling the various combinations of slow feed, rapid feed, and stop cycles. Overload relays and fuses are employed to protect the motors. An overload of any motor stops the entire machine automatically, and the operator can stop the machine instantly at any point in the cycle by turning a button. Safety stop-dogs on the table prevent over-travel.

There are three motors besides the coolant pump unit. One motor drives the spindle, while the other two drive the table feeds and rapid traverses. The spindle is driven by a motor with a built-in solenoid brake. This motor is mounted vertically in the ventilated compartment in the base, and is directly connected to the spindle-head drive-shaft.

Vertical adjustment of the spindle head is facilitated by the anti-friction mounting of the accurately threaded adjusting screw, a large handwheel, and a clearly marked micrometer dial. The alloy-steel spindle is hardened and ground, runs in anti-friction bearings, and has the National Machine Tool Builders standard spindle nose No. 40. The machine is made in two sizes, having table feeds of 18 and 24 inches. Pick-off gears are employed to obtain a wide range of table feeds and spindle speeds.

Thomson-Gibb Bench Type Spot Welder



Thomson-Gibb Bench Type Welder for Small Work

A bench type of machine designed for the mass production welding of small parts has been brought out by the Thomson-Gibb Electric Welding Co., Lynn, Mass. This machine is equipped with a 10-kilovolt-ampere transformer, and is driven by a 1/6-horsepower motor through a reduction unit. It is designed to provide the precision features of a standard floor type welding press. A cam at the back actuates a rocker arm which moves the welding spindle up and down with a straight-line motion. This insures a positive contact at the point of the weld, smooth action, and a slow, uniform electrode wear. To further insure uniformity in the application of pressure, the machine is equipped with an adjustable pressure spring.

The operation of this machine is controlled by a foot-switch which acts through a solenoid clutch. On the model illustrated, only the terminals to which the electrodes are attached are water-cooled; however, the electrodes can also be water-cooled when the nature of the work requires it. The machine has a capacity for welding two pieces of 1/16-inch iron or steel. It has a pressure range of from 25 to 100 pounds, and a throat depth of 4 3/4 inches.

Hannifin Presses for Pressing and Straightening Operations

A high-speed portable hydraulic press for pressing timing gears and harmonic balancing units into position on automobile engine crankshafts has been developed by the Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill. This press, designated as the "Hy-Power," is shown in Fig. 1. It is fitted with a locating fixture, which simplifies the handling and aligning of the press with the work and assures starting the parts squarely on the shaft.

The press weighs approximately 80 pounds and is controlled by a push-button in the handle. It is operated by a Hannifin hydraulic pressure generator, which is a complete self-contained unit driven by a two-horsepower motor. High-pressure hoses and a control cable connect the generator and the portable press.

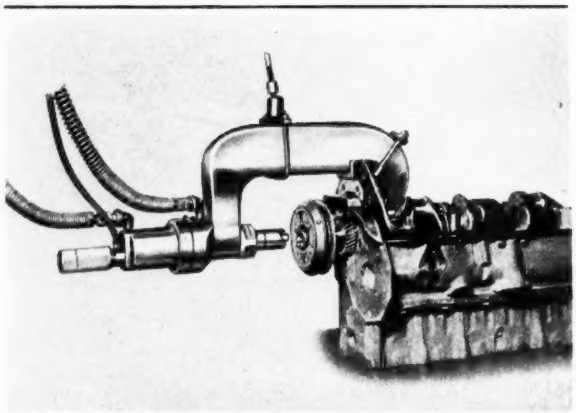


Fig. 1. Hannifin "Hy-Power" Portable Press for Automotive Assembling Operations

The high-speed operating cycle is completed automatically upon pressing the control button which actuates the automatic electric valve unit. The operating cycle includes a rapid advance stroke at moderate pressure; a high pressure for the pressing stroke; a reversal of the stroke at peak pressure; and rapid return to the starting position. The pressure pump is arranged to idle at zero pressure between cycles. The complete operating cycle requires approximately two seconds.

A hydraulic press having a capacity of 75 tons that is especially designed for straightening operations on airplane propellers and similar work is shown in Fig. 2. This machine is also a recent development of the same concern. With the exception of the table and cylinder, this straightening press is built of welded plates and shapes. Simplified handling of straightening operations and increased production are features obtained by the specially designed control mechanism. A single lever controls the entire operation of the ram with an extremely sensitive proportional control action. When the control lever is moved in either direction, the ram will move a proportional distance and then stop, and, simultaneously, the operating valve shifts to the neutral position.

When in the neutral position, the pump idles at zero pressure. By merely moving one lever, a ram movement

at a pressure of 75 tons through the exact distance that is required for the straightening operation is obtained. Thus very slight and accurate ram movements, either up or down, can be obtained. The arc of movement of the control lever is several times as great as the ram stroke and thus provides for very sensitive handling without requiring the operator to have special skill.

The hydraulic power unit with a rotary type pump is built into the base of the press. The ram may be fitted with any type of fixture required for handling the parts to be straightened. The stroke of the ram is 12 inches, and the speed rate 24 inches per minute. The return stroke is at the rate of 40 inches per minute. The table-to-ram distance, with the ram up, is 18 inches. The distance from the center of the ram to the face of the frame is 10 inches. The table is 84 inches long, and the height from the table to the floor is 36 inches. The base is 32 by 52 inches, and the over-all height 100 inches.

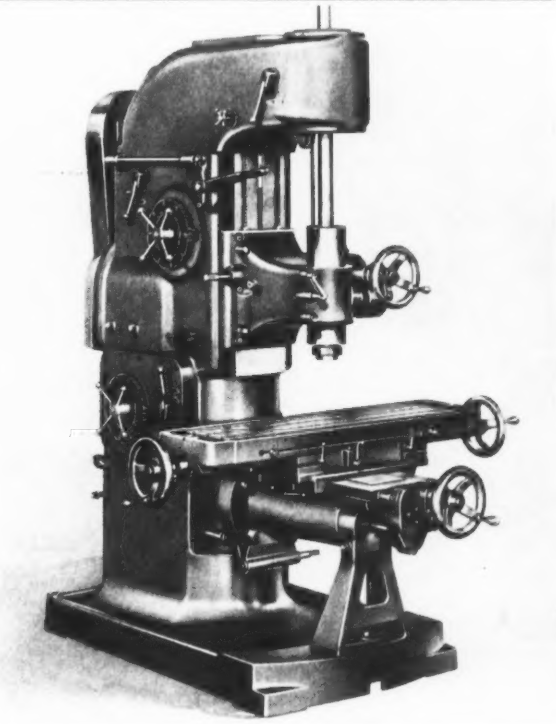
Fig. 2. Hannifin 75-ton Straightening Press Designed for Straightening Airplane Propellers

Knight Universal Vertical Milling Machine

Operations that ordinarily require several set-ups of work and perhaps the use of more than one machine can be performed with one setting of the work in a No. 40 universal vertical miller that is being introduced to the trade by the W. B. Knight Machinery Co., 3920 W. Pine Blvd., St. Louis, Mo. Accuracy and speed are features, in addition to versatility.

The machine is so constructed that the knee and table unit can be swiveled around the column. This is accomplished by assembling the knee and table unit to a large trunnion, which is fitted into the lower portion of the column. The face of the column is accurately scraped, and the front of the base is so machined that the outer table support moves with the table when it is swiveled. In addition to the swiveling movement around the column, the table can be tilted to either side from the horizontal. The degree to which the table is tilted is indicated by a graduated segment on the right-hand side of the table unit.

The spindle head is arranged to travel on an accurately fitted slide on the column face. Both the head and the spindle are counterbalanced by weights within the column. Either unit can be locked in any position, thus giving the advantage of a fixed-head construction, as well as increasing the capacity of the machine. The spindle is mounted in precision roller bearings which permit the use of high speeds and insure accuracy in fine tool work, including jig boring.



Knight Universal Milling Machine with Knee and Table Unit that can be Swiveled around Column

Sixteen spindle speeds ranging from 40 to 1400 revolutions per minute are instantly available through a large easy-reading dial on the left-hand side of the machine. On the head of the machine, there is a smaller easy-reading dial which permits the quick selection of spindle feeds from 0.002 to 0.010 inch per

revolution. There is a power vertical feed for the spindle head of 8 inches in either direction. Built into this feed mechanism is an automatic throw-out which prevents the spindle from traveling beyond its limits. There is also a graduated throw-out which can be set for drilling or boring in either direction to a predetermined depth.

Sixteen table feeds ranging from 1/2 inch to 12 3/4 inches are instantly available through another easy-reading dial below the spindle speed dial. An automatic throw-out is built into this feed mechanism also, which operates whenever the table feed is overloaded.

Important specifications include: Longitudinal table power feed, 28 inches; transverse power table feed, 14 inches; minimum and maximum distances from table to spindle, including the adapter, 0 and 21 inches, respectively; distance from column face to center of spindle, 14 inches; travel of spindle head on column, 15 inches; and travel of spindle in head, 8 1/2 inches.

Ajax Bolt Heading and Upsetting Forging Machine

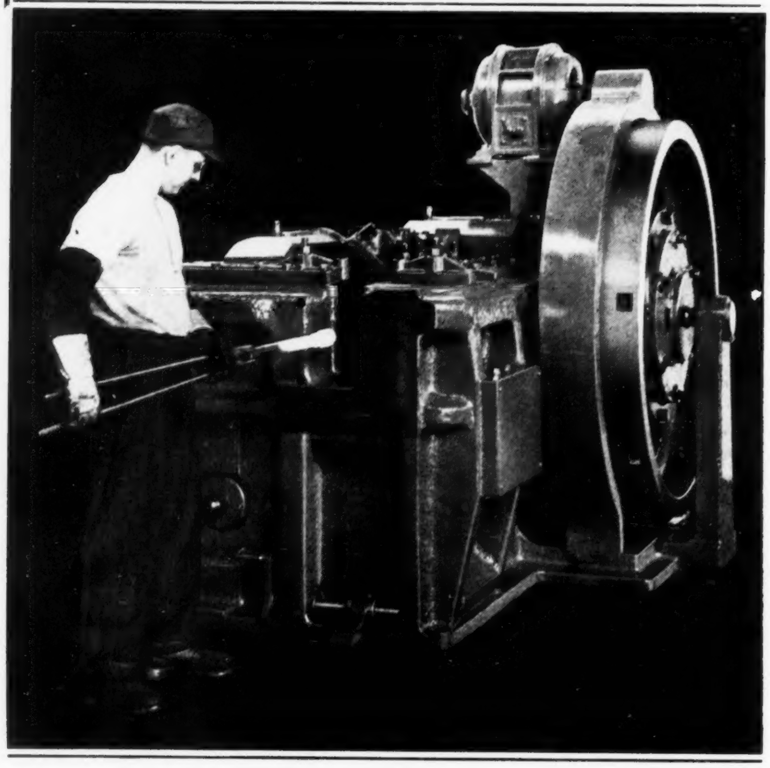


Fig. 1. Ajax 1 1/2-inch Forging Machine Equipped with Air Clutch

A bolt heading and upsetting forging machine in two sizes, with rated capacities of 1 and 1 1/2 inches, has been brought out by the Ajax Mfg. Co., Cleveland, Ohio. These machines are equipped with the patented Ajax air clutch used on the larger machines of this company's manufacture. They occupy less floor space than earlier models, and have higher production rates on a wide variety of intricate forgings, as well as nuts, bolts, and rivets.

The instantaneous response of the air clutch to the movement of the control treadle results in increased production and less fatigue of the operator, and in many cases, makes possible the completion of a single heat of forgings that formerly required reheating after preliminary upsetting. The smooth, cushion action of the machine eliminates the jar that formerly accompanied the engagement of the clutches on types previously employed.

When the foot-treadle is depressed, it releases the band brake, and at the same time, opens the air valve to the clutch. This introduces compressed air behind an air piston carried by the flywheel, and applies pressure directly to the friction plates, shown in the disassembled view of the clutch, Fig. 2, clamping them together and starting the machine. At a predetermined point in the operating cycle the air is cut off, disengaging the clutch. A cam on the rim of the brake-drum then sets the brake, which stops the machine accurately on the open stroke.

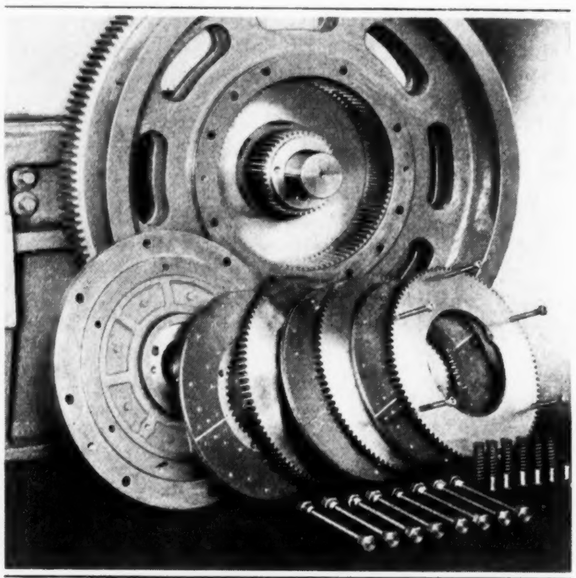


Fig. 2. Disassembled View of Ajax Air Clutch

The patented slide construction makes the entire pitman assembly completely accessible for inspection or adjust-

ment. The right-hand side liner of the header slide is adjustable to compensate for any out-of-parallel wear after long periods of service. Means for easily maintaining the heading tools concentric with the die impressions make it possible to hot-punch holes. The moving die is supported between bearings which maintain its face square with that of the stationary die; in this way, the production of accurate and uniform forgings is insured.

The die grip is actuated from an eccentric pin on the end of the crankshaft, which permits high-speed operation. A fully automatic safety mechanism protects the machine from damage by over-sized or misplaced work. This device resets itself, so that production is not interrupted. An automatic lubricating system is built into the machine.

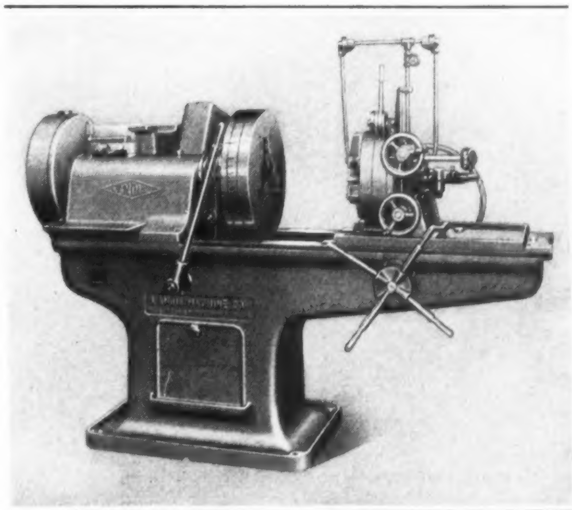
Akron Screwdriving Machine

Landis Pipe Threading and Cutting Machine

A 2-inch pipe threading and cutting machine of improved design has been brought out by the Landis Machine Co., Inc., Waynesboro, Pa. This machine is more rigid and weighs slightly more than the previous machine, although the floor space requirements are practically the same, being 3 feet 7 inches by 6 feet 8 1/2 inches. The bed has been made heavier and stronger by increasing the thickness and number of webs and ties. The ways are covered by steel guards attached to the cross-rail. These guards telescope under the headstock, and wipers are provided at the opposite end to clean the ways.

The eight-speed, built-in gearbox has a single-pulley drive. When motor-driven, a three-horsepower motor is mounted on top of the headstock and connected to the main driving shaft by a silent chain drive. The chuck speeds range from 30 to 163 R.P.M. The speed of the main driving shaft is 425 R.P.M. The speed change-gears are all made of chromium-nickel steel and run in oil. The main spindle gear also runs in oil, and all gears are mounted on anti-friction bearings.

The headstock is set directly on the bed instead of on raising strips, as on the previous machine. The machine has a capacity for threading pipe from 1/2 to 2 inches, inclusive. The carriage travel is 14 inches. The belt-driven machine weighs 2800 pounds, and the motor-driven machine 3000 pounds.



Landis 2-inch Pipe Threading and Cutting Machine of Improved Design

Akron Automatic Screwdriving Machine

A full-automatic screwdriving machine designed to meet the requirements of present-day production methods has been developed by the Akron Automatic Machine Co., 100 Beech St., Akron, Ohio. The mechanically controlled screwdriving cycle is started by simply touching a pedal with the toe. The multiple-plate friction clutch is of rugged design, but extremely sensitive and instantly adjustable to any desired torque. A screwdriver end with an inserted spring steel blade is provided, which can be replaced quickly without disturbing any adjustments.

The long stroke enables screws to be driven into deep recesses with minimum clearance. The new type magazine completely eliminates marring or discoloring of screws. An adjustable screw track provides means for handling a complete range of commonly used sizes and kinds of screws and bolts up to 1/4 by 1 1/4 inches. Special tracks are required for larger sizes.

The machine can be easily adapted for feeding and driving nuts. With an additional magazine and the required holding fixture, it will assemble bolts and nuts mechanically, either alone or through small parts. The machine is 6 feet 6 inches high over all and has a throat depth of 11 1/4 inches and a stroke of 4 1/2 inches.

Brown & Sharpe Milling Machine with Swiveling Spindle Head

A swiveling spindle head, spindle speeds up to 1800 revolutions per minute, and a deep throat are features of a light type No. 2 vertical-spindle milling machine recently developed by the Brown & Sharpe Mfg. Co., Providence, R. I. This machine is designed to handle the ordinary run of work in the average shop or tool-room.

The spindle head can be set at any angle up to 90 degrees each side of the vertical position, the setting being shown by a scale reading to half-degrees. A lever-operated locking plunger provides for exact vertical realignment of the spindle head. The spindle is provided with an axial hand movement or feed of 3 inches which facilitates step-milling and setting up. The aluminum handwheel controlling this movement can be easily transferred to either side of the spindle head.

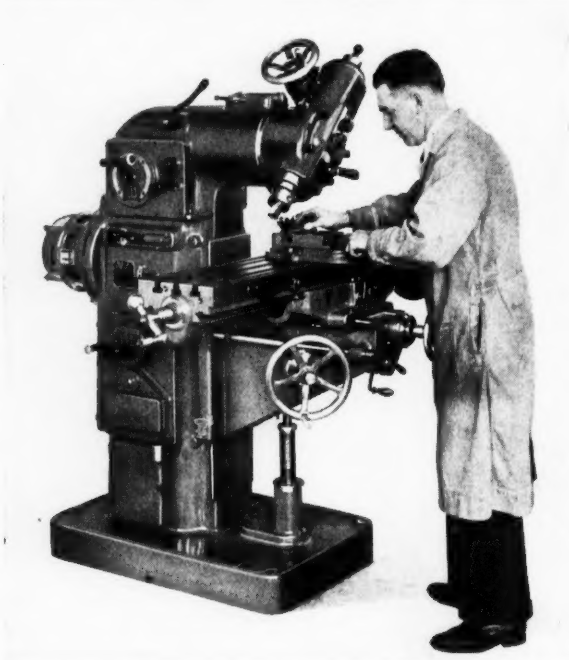
An adjustable dial permits adjustment of the spindle position to 0.001 inch, and a lever at the lower front of the head enables the spindle to be clamped in any desired axial position. Hardened steel stops attached to the spindle slide and to the head are accurately ground on their facing surfaces to enable measuring blocks to be used for high precision set-ups, for gaging the depth of cut, etc. These stops are particularly useful when duplicate parts require the machining of several different depths on each piece.

Sixteen spindle speeds, ranging from 55 to 1800 revolutions per minute, are available. There are sixteen changes of longitudinal, transverse, and vertical power feed, which are independent of the spindle speeds and range from 1/2 to 18 1/4 inches per minute. The machine is gear-driven from a constant-speed flange type, three-horsepower motor. The starting and stopping lever operates a mechanical brake for stopping the spindle quickly.

The following automatic power feeds are available: Longitudinal feed, 28 inches; transverse feed, 10 inches; and vertical feed of the knee, 15 inches. Dials graduated to 0.001 inch provide for manual adjustments. The column is designed to provide a throat distance of 12 inches throughout the entire length of the vertical travel. With the spindle vertical, the greatest distance from the end of the spindle to the top of the table is 18 inches. With the spindle horizontal, the greatest distance from the center of the spindle to top of table is 24 3/4 inches.

Taylor Precision Drilling Machine with Supersensitive Spindle

A precision drilling machine designated as the HI-EFF, which has been especially designed for the drilling of small holes, down to 0.002 inch in diameter, has been brought out by the Taylor Mfg. Corporation, 2330 W. Clybourn St., Milwaukee, Wis. The spindle is extremely light, and is counterbalanced by a weight inside the drill post. It is provided with ball bearings, and is



B & S Swiveling-head Milling Machine

Taylor Precision Drilling Machine

so sensitive that the operator can actually feel a 0.002-inch drill cut into the material being drilled. With this supersensitive "feel" fewer drills are broken and a minimum of time is required for drill sharpening.

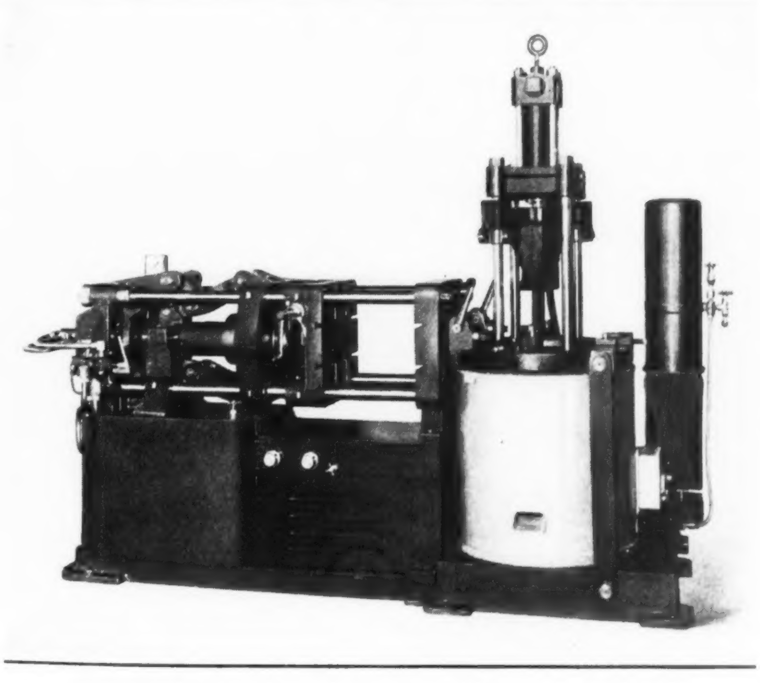
The speed range is from 2000 to 40,000 revolutions per minute, and is obtained by means of cone pulleys and a quick-change electrical governor shown at the bottom of the motor. This governor controls the speed of the motor in steps of 100 revolutions per minute, and the motor itself is spring-cushioned. Each machine is built for a particular job, in order to insure the degree of accuracy required.

Improved Lester Die-Casting Machine

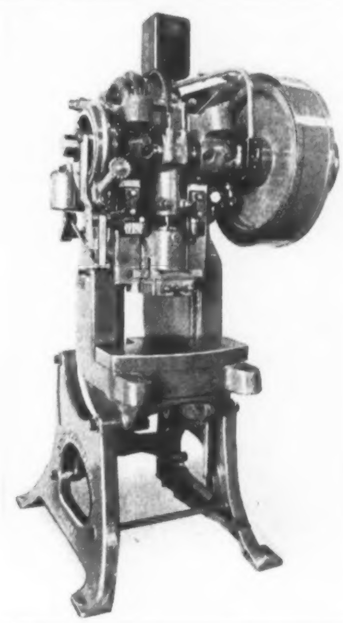
Full hydraulic operation, finger-tip automatic control, and quick adjustment of the dies for accurate alignment are features of the improved H-HP-2 die-casting machine designed by the Lester Engineering Co. and now being manufactured and sold as a product of the Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, Ohio.

All parts of the cycle of operation are automatically controlled and are easily adjusted by means of positive finger-tip controls. The length of time that pressure is maintained on the molten metal and the time allowed for cooling the metal in the die are accurately adjustable within a fraction of a second, each adjustment being made independently. A minimum of 400 cycles to a maximum of 600 cycles per hour can be completed, provided the die is so constructed as to allow the casting to be efficiently accomplished at this production speed. The machine is provided with an effective heat control.

The die opens 7 1/2 inches; the maximum die height, without the automatic ejector box, is 14 1/2 inches, and the minimum height, with the automatic ejector box, is 6 1/4 inches. The clearance between bars is 12 by 14 inches. The metal pot capacity is 350 pounds of zinc. The locking pressure of the die is 70 tons, and the weight of the machine is approximately 6400 pounds. The plunger has a capacity of from four to five pounds of zinc.



Lester Die-casting Machine, Built by the Phoenix Ice Machine Co.



V & O Inclinable Press of 30-ton Capacity

V & O High-Speed Inclinable Press

A high-speed press of the inclinable type having a capacity of approximately 30 tons and capable of operating at a speed of 300 strokes per minute, has been brought out by the V & O Press Co., Hudson, N. Y. This machine is fitted with a multiple-disk friction clutch and a brake that works in conjunction with the foot-treadle and that can be fully released. It is so arranged that when the treadle is released, a cam holds the brake open until a switch disengages the clutch, at which time the brake is applied, stopping the press at the top of the stroke.

The machine is fitted with a well-known lubrication system which automatically lubricates all bearings. The new press has all the outstanding features of other presses made by this company, such as the long slide, overhanging bearings, and eccentric shaft, as well as a very shallow throat and a filled-in bed, which gives maximum rigidity for heavy work. These machines can also be fitted with feeds suited for high-speed operation.

Miller & Crowningshield Hand Milling Machine

A hand milling machine equipped with a V-belt drive is being introduced on the market by Miller & Crowningshield, Greenfield, Mass., for use in production milling. The driving motor, controlled by a conveniently located reversing switch, is mounted in the base on an adjustable plate and can be easily removed. Motors can be furnished in different types to suit requirements.

A four-step V-belt pulley is mounted on the motor shaft. A speed range of from 80 to 730 revolutions per minute is normally available with the standard steel pulleys incorporated in the drive. These pulleys can be changed, however, to give almost any speed range desired. All jack-shafts and spindles are fitted with Timken bearings and Zerk oilers. All V-belts have independent adjustment.

A rapid table movement of 14 1/2 inches is obtained through a rack-operated hand-feed. A power feed can be supplied, however, if desired. The cross-feed is 3 1/4 inches, while the vertical movement of the knee is 9 inches. The table measures 6 1/2 by 22 inches and is equipped with adjustable stops. The machine has a weight of approximately 650 pounds.

Miller & Crowningshield Improved Milling Machine

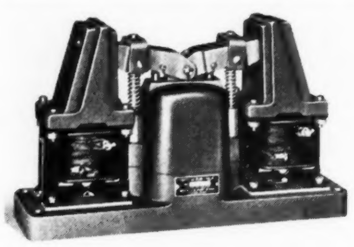
Carboloy General-Purpose Tool Kit

Nine "milled and brazed" Carboloy cemented-carbide tools are included in a tool kit for general machining operations which is being placed on the market by the Carboloy Company, Inc., 2987 E. Jefferson Ave., Detroit, Mich. A 20-page booklet which shows the new rapid grinding technique and a 12-page booklet which suggests more than fifty applications for the nine tools are furnished with the kit.

Carboloy General-purpose Tool Kit

This kit is particularly well adapted for the smaller shops, in which the limited production of any one type of part generally does not warrant the purchase of single-purpose carbide tools. The nine tools are designed for turning, facing, and boring operations on engine lathes, turret lathes, boring mills, and boring-bars.

"Milled and brazed" means that manufacturing operations on the tools have been completed, except for grinding. It is intended that the user will do this grinding according to the instructions given in the manual supplied. This method of supplying the tools considerably reduces the initial cost.



"Quick-as-Wink" Solenoid-operated Air Valve

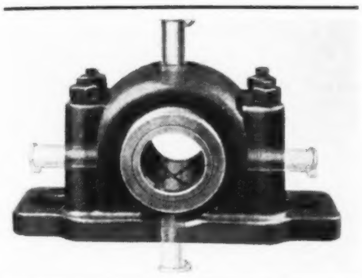
Solenoid-Operated Air Control Valve

A "Quick-as-Wink" double-solenoid air control valve designated No. 1496, which can be operated as a six-way valve or as a double three-way valve, has been brought out by C. B. Hunt & Son, Salem, Ohio. This valve can also be operated as a four-way compound exhaust valve. In all of the combinations mentioned, the valve is normally closed, but it can be supplied for normally open operation. The valve cage and the solenoids are mounted on a plate to which the piping is fitted, and can be removed for inspection without disturbing the piping.

The valve bodies are of stainless steel and the entire units are designed for exceptionally long life in service. Manufacturers have reported cases in which these units have operated more than fifty million times without repairs, leakage, or inspection. Units of the type illustrated are made in 3/8-, 1/2-, and 3/4-inch sizes.

Randall Universal Pillow Block

Because it is often impossible to know in advance of a machine installation how the pillow blocks will be mounted, the Randall Graphite Products Corporation, 609-613 W. Lake St., Chicago, Ill., has developed a universal type, double-reservoir, oil-return pillow block that can be mounted in any position to suit the requirements of each installation. With this pillow



Randall Pillow Block with Provision for Mounting Oil-cup on Any Side

block, it is only necessary to select the mounting position needed, unscrew the oil-cup, turn the ball to this position, and reinsert the oil-cup vertically. The different positions in which the oil-cup can be mounted are shown by the phantom views in the illustration.

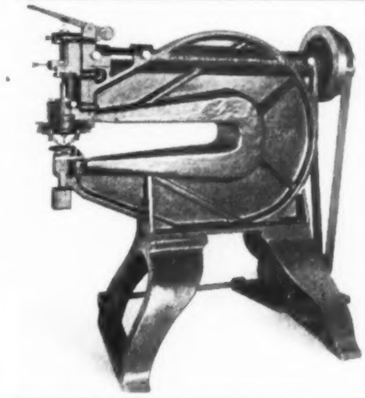
This pillow block, like other bearing units made by this company, has two large reservoirs in the ball section. A supply of oil is placed in the upper reservoir which feeds the shaft, as needed, through graphite feed plugs and graphite pressure-packed channels. Oil recovery grooves divert the unconsumed oil into the lower wool-packed reservoir, from which it is again fed to the shaft and bearings through the lower graphite feed plugs. The bearing is self-aligning and is precision-bored to close tolerances.

Gray Turret-Head Metal-Cutter

A turret-head metal-cutter with a 36-inch throat and a capacity for cutting 3/8-inch material has been placed on the market by the Gray Machine Co., Box 596, Philadelphia, Pa. Improvements incorporated in this machine will be added to all sizes of turret-head cutters made by this company. A two-speed floating-power drive which keeps the belt tight at all times and automatically eliminates vibration from the drive is a feature of the new machine.

The machine operates at speeds of 450 and 900 revolutions per minute, cutting from 18 to 40 inches per minute, depending on the thickness of the stock and the speed at which the machine is operated. Stock under one-half the maximum-capacity thickness can be cut at high speed with the machine operating at 900 revolutions per minute.

These machines are now made with larger bases which cover about four times as much floor space as previous machines. This increased spread of the base makes it possible to mount the machines on a floor of light construction without developing undesirable vibration as a result of the rapid cutting action of the tool.

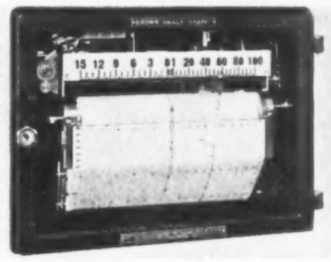


Gray Metal-cutter with 36-inch Throat

Instrument for Measuring Quality of Furnace Atmospheres

The Brown Instrument Co., Philadelphia, Pa., has developed an instrument known as the "Analy-Graph" for determining the quality of furnace atmospheres. Tests have been conducted with this instrument on both electric and fuel-fired furnaces. Two widely differing sources of gas feed and also a wide range of temperatures with varying air-gas ratios have been investigated.

The recording instrument is of the potentiometer type and is equipped with a 12-inch wide chart graduated so as to render the equipment applicable for measuring the quality of atmosphere, whether resulting from complete or incomplete combustion or from dissociation.

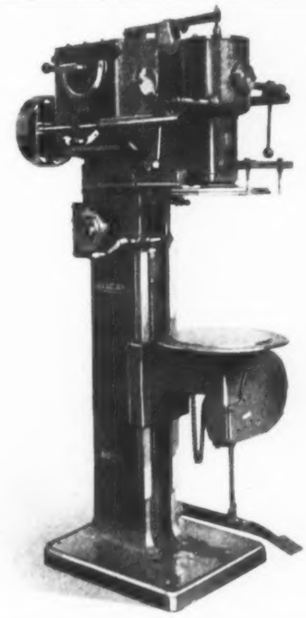


Brown Instrument which Shows Quality of Furnace Atmospheres

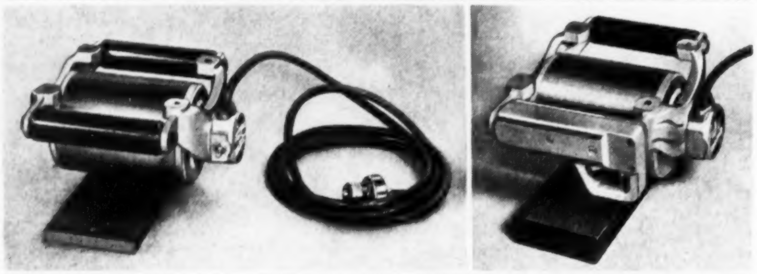
The "Analy-Graph" is especially suitable for use in heat-treating departments for operations in which it is desired to maintain special gas atmospheres around the work, as in preheating, hardening, carburizing, etc.

Niagara Vertical Single-End Double-Seamers

Two vertical single-end double-seamers, designed for semi-automatic double-seaming of heads in metal containers, have been



Niagara Seamer for Double-seaming Heads in Metal Containers



Standard and Pistol Grip Types of Demagnetizers Brought out by the O. S. Walker Co.

added to the line of equipment made by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. The No. 304 machine has a capacity for seaming 24-gage material, while the No. 305 machine handles 22-gage material.

These machines are provided with vertical cams for changing the ratio of feed of the rolls. Pick-off gears make it possible to vary the speed ratio between the spindle and the seaming rolls. These machines are available either with or without the quick-change gears which are designed to give four speeds.

Walker Portable Alternating-Current Demagnetizer

An alternating-current demagnetizing unit suitable for a wide variety of demagnetizing work and particularly adapted for the removal of residual magnetism from machine knives, shear plates, large dies, etc., is being placed on the market by the O. S. Walker Co., Inc., Worcester, Mass. The construction of this demagnetizer is unique, in that the laminated core is recessed for the energizing coil and is enclosed in a cylinder about 4 1/2 inches in diameter by 5 1/2 inches long, which rotates about the core as the unit is moved along the work. The cylinder is of a material that exerts minimum influence on the path taken by the demagnetizing flux developed by the coil.

In the standard type unit, shown at the left in the illustration, the current to the energizing coil is controlled by a snap switch. A pistol-grip switch controls the current to the more powerful coil of the unit, shown to the right, which is recommended for use in some cases when the work is an inch or more in thickness.

In demagnetizing a machine knife or shear, for example, the unit is energized and rolled along the work, this movement being continued in the same plane for a short distance beyond the end of the work. Frequently, one pass over the work is sufficient, but in some cases, a second pass may be desirable. Work held on a magnetic chuck can be easily removed after demagnetizing. Drilled lugs on the frame of the unit permit attaching it to a bench so that the work can be drawn across the roller instead of passing the roller over the work.

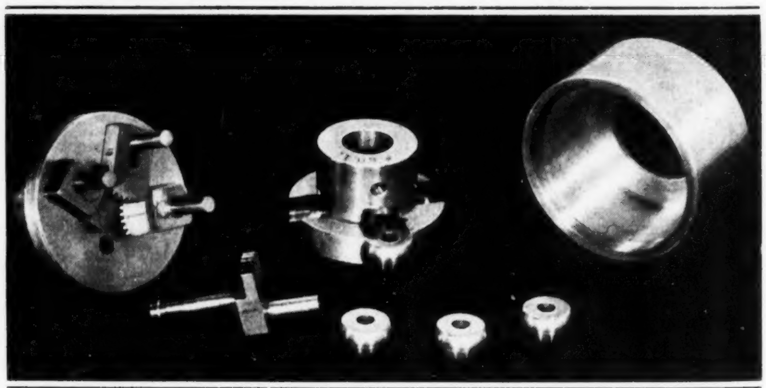
The standard unit weighs approximately 18 pounds, and is available for use on 60 cycle, 110-volt and 220-volt, single-phase alternating current. Special coils may be furnished to accommodate other frequencies.

Harris Universal Self-Aligning Coupling

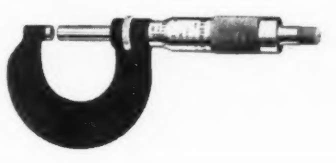
A universal self-aligning coupling especially adapted for drives where it is difficult to align the driving and driven shafts, where alignment is not positively insured, or where the foundations that support the driving and driven members are not rigid has been placed on the market by the Harris Coupling Co., 265 W. 40th St., New York City. This coupling allows a parallel misalignment or displacement of 3/16 inch between the driving and driven shafts, and 15 degrees of angular misalignment.

In the illustration, a No. 1 coupling is shown disassembled. The coupling half at the left has four oscillating members which are fitted with pins at one end and have gear segments cut on the other end. These segments oscillate and permit the pins to assume radial offset positions to compensate for parallel misalignment. The rollers seen in the illustration are assembled on the pins to fit into machined recesses in the spider shown in the center. This construction takes care of angular misalignment.

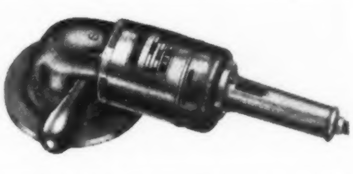
These couplings are made in capacities of 3 to 500 horsepower, with bore diameters from 3/4 inch up. Either half can be used as the driving member.



Harris Coupling in which Gear Segments and Rollers Permit Parallel and Angular Misalignment



B & S Micrometer with Stainless-steel Barrel and Thimble



Stanley Electric Disk Sander of Streamline Design

Brown & Sharpe Stainless Micrometers

Two new micrometers with barrels and thimbles of stainless steel and black frames have been added to the extensive line of products made by the Brown & Sharpe Mfg. Co., Providence, R. I. These Nos. 11B and 59B moderate-priced micrometers are equipped with anvils and spindles of the same wear- and stain-resisting steel as other B & S micrometer calipers. The I-section frames are designed for strength with lightness. The anvils project 3/16 inch which is a convenience in measuring slots, etc.

These micrometers measure from 0 to 1 inch in thousandths of an inch or from 0 to 25 millimeters in hundredths of a millimeter. The No. 59B micrometer is provided with a clamp ring as shown.

Stanley Electric Disk Sander

An electric disk sander designed for both production and repair work is being introduced on the market by the Stanley Electric Tool Division of the Stanley Works, New Britain, Conn. This sander is equipped with ball bearings throughout, is of a streamline design to facilitate its application in close places, and is light in weight. The high-speed universal motor is enclosed in an aluminum-alloy housing. The sander is furnished with a 7-inch flexible pad and twelve sanding disks, six for metal and six for wood.

Equipped with accessories that make it a versatile tool, the sander can be used for such operations as scouring and cleaning vats, polishing metal pipes, removing labels and stencils, sanding wood and metal, removing paint and rust, rubbing and polishing lacquered surfaces, grinding heavy welds, and smoothing castings, automobile fenders, etc., before and after the application of filler paint.

Westinghouse Ignitron Seam Welder

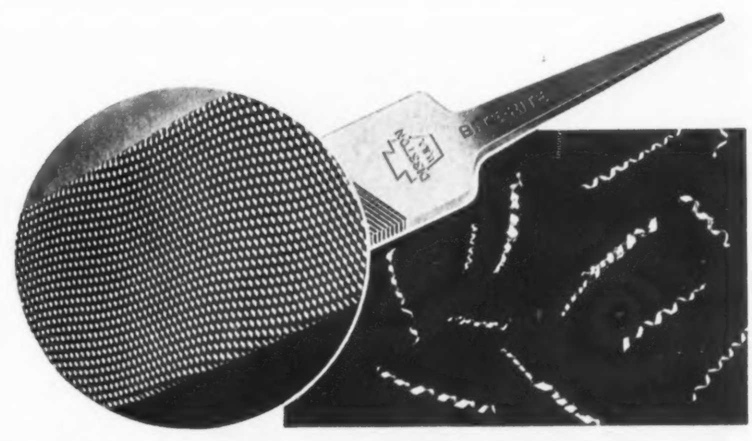
A new ignitron seam-welder control, utilizing ignitron tubes has been recently placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This control "times" the power impulses delivered to a wheel type electrode resistance welding machine in terms of a definite number of power cycles. Among its features is an inductive timer, consisting of a synchronous driven disk which rotates once per second. This disk contains 120 holes, each of which corresponds to a half cycle of the welding current.

The use of ignitron tubes permits operation at voltages no higher than line voltages and eliminates the need of power contactors and transformers. The timing desired is obtained by plugging steel pins into the proper holes in the disk. The timing obtained is so precise that it greatly improves the quality of the welds, including those made in very light gage steels. It is especially suitable for welding heavy gage steels which require heavy welding currents and special metal alloys that demand accurate timing. It is also suitable for welding with a heavy current such as is required for aluminum and Olympic bronze.

Disston "Bite-Rite" File

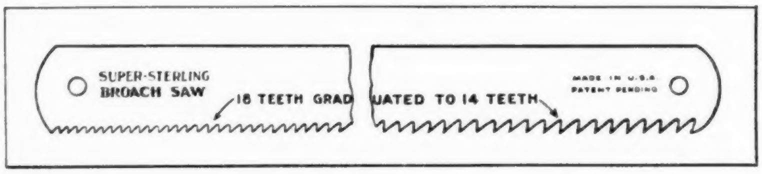
A file known as the "Bite-Rite," having teeth of an entirely new form designed to combine speed of cut, long life, and smoothness of the filed surface, has been brought out by Henry Disston & Sons, Inc., Philadelphia, Pa. The new method of cutting the teeth originated by this company produces staggered teeth, as shown in the accompanying illustration.

These teeth produce long,

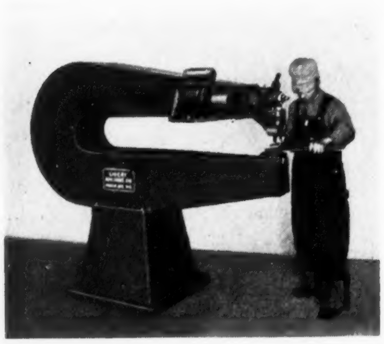


Disston "Bite-Rite" File and Chips Produced by File Teeth

heavy, curling chips, such as shown to the right in the illustration. The chips resemble those made by a lathe tool, and are an indication of the efficiency of this new design, with its staggered teeth and round, smooth, non-clogging open gullets.



"Super-Sterling Broach-Saw" Developed by the Diamond Saw & Stamping Works



Libert High-speed Shear with Welded-steel Frame

Libert High-Speed Shear

A high-speed shear designed for cutting irregular shapes from 12-gage stainless steel or similar alloys has been brought out by the Libert Machine Co., Green Bay, Wis. This shear, designated as the Model 1060, is made with an all-steel frame of welded 5/8- and 7/8-inch plate. The machine has a throat depth of 60 inches instead of the usual 36 inches, and will maintain the same cutting speed as the standard shear. Hand control permits inside cutting without requiring starting holes. This machine is designed to shear the material accurately, and it will not feed itself by the action of the cutters.

Super-Sterling Broach-Saw

An entirely new arrangement and design of teeth for hacksaw blades has been developed by the Diamond Saw & Stamping Works, 347 Davey St., Buffalo, N. Y. Blades with this new tooth arrangement will have the trademark "Super-Sterling Broach-Saw."

From the first tooth on the starting end of the saw to the last tooth on the finishing end, there is a progressive increase in the pitch and height of every tooth, as shown in the accompanying illustration. Each succeeding tooth of the blade, being slightly larger, takes a larger bite, resulting in an increase in the cutting speed. In a hand blade with teeth starting at 18 to the inch and finishing at 14 to the inch, coarse-tooth cutting speed is obtained with the smooth operation of the finer tooth.

Miller Light-weight Transformer Type Welder

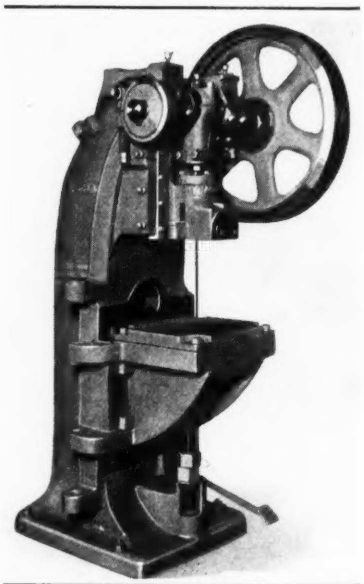
Miller Transformer Type Welder

To supplement its line of portable arc welders, the Miller Electric Mfg. Co., Appleton, Wis., has brought out a light-weight, transformer type welder for the low-priced field. This welder, designated as the "Miller Standard Arc," is made in four capacities ranging from 130 to 300 amperes. It is equipped with a rotary knife switch control, on which is marked the amperage for each welding step.

The light weight of this welder is due to the fact that the cabinet is made of wood and that fewer amperage controls are used than on regular welders. These welders are designed for safe, easy operation, and can be used for welding on grounded surfaces without danger to the operator.

Niagara Fourteen-Point Sleeve Clutch Applied to Horn Presses

A fourteen-point engagement sleeve clutch, which has been applied to various punch presses built by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y., since its description in August, 1935, MACHINERY, page 771, is now also being supplied as standard equipment on the entire line of Niagara horn presses. The features of this clutch include instant engagement, a built-in single-stroke mechanism with a



Niagara Horn Press Equipped with Fourteen-point Engagement Clutch

throw-out supplied with anti-friction bearings, and a positive lock that prevents accidental engagement of the clutch when dies are being set. Detailed information concerning the operation and design of the clutch was given in the previous article.

Electrode for Small Transformer Type Alternating-Current Arc Welders

An electrode known as No. 520 has been announced by the Wilson Welder & Metals Co., 60 E. 42nd St., New York City, for use with small transformer type alternating-current arc welders. The ability to strike and maintain an arc without difficulty is the principal feature of this new electrode. It works equally well with alternating or direct current, and slag interference is reduced to a minimum.

* * *

You cannot do today's work with yesterday's machines if you expect to be in business tomorrow.

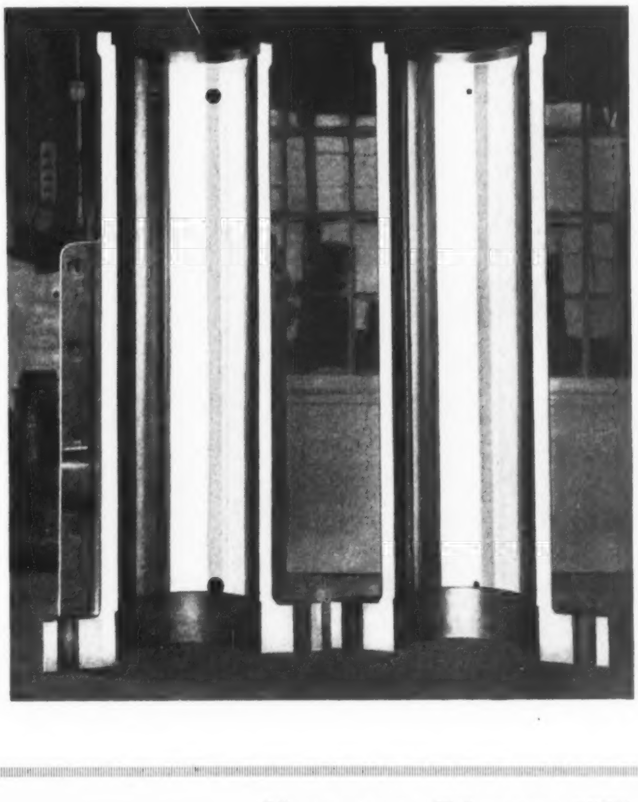
Industrial Progress is Practically the Only Progress of Civilization

Dr. Hugo Munsterberg, for many years previous to his death head of the Department of Psychology of Harvard University, a man in no sense prejudiced in favor of industry, once made a statement in which he gave industry credit for being practically the only force in our civilization that has definitely made for progress.

"In no direction," he said, "has man progressed so much in the last two thousand years of civilization as in his commercial endeavors. We are too easily inclined to fancy that mankind has changed and made progress in every line, but that is certainly an illusion. Our legal life is not superior to that of the old Romans, nor are our state and civic policies different from those of ancient times; but in the economic life, with its production of goods for practical use and their transportation and distribution, the change is indeed a fundamental one. The modern factory, railway, steamer, and cable are incomparable with the primitive methods of mankind. It seems as if we could nowhere measure the progress of the civilized human race more directly than in the glorious changes in commerce and industry."

Rapid Gains in Electrical Industry

The rapid improvement in business in 1936 is clearly indicated by the report on orders received by the General Electric Co., recently made public. During 1936, the company received orders amounting to $296,748,219, as compared with $217,361,587 during 1935, an increase of 37 per cent. The orders received during the last quarter of the year showed an increase of 45 per cent over the corresponding quarter of 1935.



Hydraulic Cylinders for the Hydram Drilling and Boring Machines Built by the Barnes Drill Co. are Finished by Honing. The Illustration Shows a Large Cylinder for this Purpose that Has Been Sawed in Half to Show the Mirror Finish Obtained by Honing

New Manager of Machine Tool Builders' Association

Tell Berna, for the last six years general sales manager of the National Acme Co., Cleveland, Ohio, has been appointed general manager of the National Machine Tool Builders' Association, with headquarters at 10525 Carnegie Ave., Cleveland, Ohio. Mr. Berna succeeds Herman H. Lind, who has been general manager of the Association since 1932 and who is now executive vice-president of the American Institute of Bolt, Nut, and Rivet Manufacturers. Previous to his association with the National Acme Co., Mr. Berna was manager of the Cincinnati office of Cutler-Hammer, Inc., and later sales manager of the G. A. Gray Co., Cincinnati, Ohio, and of the Union Twist Drill Co., Athol, Mass. He is a graduate of Cornell University with the degree of Mechanical Engineer.

Tell Berna, Recently Appointed General Manager of National Machine Tool Builders' Association

Mrs. Frida F. Selbert continues as secretary of the National Machine Tool Builders' Association.

* * *

The repair by bronze-welding of a fractured Diesel engine head for a western public service company saved the difference between the cost of \$250, plus freight, for another engine head, and a cost of approximately \$30 for welded repair.

Losses Due to Obsolete Equipment Eliminated

The Diamond Chain & Mfg. Co., Indianapolis, Ind., a well-known manufacturer of roller chain drives, recently gave its plant a thorough "house cleaning," in order to take full advantage of the marked progress in machine developments that have taken place during the last few years. In all, forty-nine tons of machine tools were sold at scrap prices averaging \$10 a ton. This meant a great many machines, since the equipment used by the company is of a comparatively light type. In selling these machines at scrap prices, there was an apparent loss only. In reality, the company was taking a profit. The machines had served their purpose and had more than earned their original price; now they were beginning to waste more through their inefficiency, compared with new equipment, than it cost to replace them. Therefore, the company decided to stop the waste incident to using obsolete machines and to make real profits out of using modern equipment.

* * *

Correspondence Course in Diesel Engineering

The University of California, Berkeley, Calif., announces that the University's Extension Division has an up-to-date correspondence course in Diesel engineering which will give the practical operator a thorough grasp of fundamental principles, assisting him in the operation and maintenance of Diesel engines. Further information can be obtained by addressing the University of California Extension Division, 301 California Hall, Berkeley, Calif.

* * *

According to figures compiled by the Automobile Manufacturers Association, the total output of motor vehicles by the members of this Association, which includes every important motor vehicle manufacturer in the United States except Ford, amounted to 3,512,436, an increase of approximately 650,000 vehicles over the output in 1935, or 23 per cent. In only two years, 1928 and 1929, have the members of the Association shipped more vehicles than they did last year.

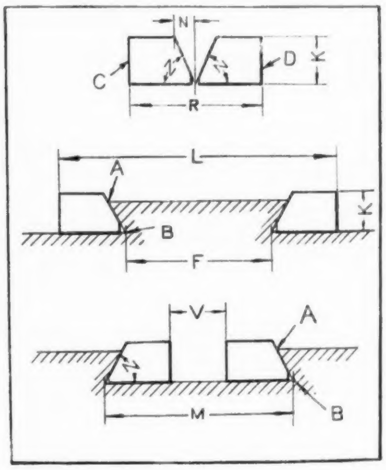
Measuring Rails Simplify Measurement of Dovetail Slides

By HERBERT E. BOSCH

The dovetail slides or ways used on machine carriages and tables rarely have sharp edges or corners that are suitable for taking measurements at the points indicated as *A* and *B* in the accompanying illustration. For model-building or production on a small scale, it is possible to measure dovetail slides accurately in the manner described in the following:

Two hardened and polished rails *C* and *D* are used in making the measurement. The measurement *R* is stamped on both rails and the measurements *L* and *V*, which are shown in the illustration, can be determined by micrometers and gages such as are available in all shops. The measuring rails should be placed on the flats of the rail, so that they rest in place without pressure or play.

The dimension $F = L - R$, and the dimension $M = V + R$. Also, $L = R + F$ and $V = M - R$.



Diagrams Indicating Method of Using Rails for Measuring Dovetails

This means of measuring is especially useful in the work-shop, as it eliminates the necessity of solving triangles. In making the rails, care should be taken to grind the angle flats last, that is, after the other two sides have been ground. The removal of the sharp edges should not be forgotten, as a clearance is required at this point to prevent dust from causing inaccurate measurements.

NEWS OF THE INDUSTRY

California

William F. Fischer has joined the sales staff of the San Francisco office, 866 Folsom St., of the Lincoln Electric Co., Cleveland, Ohio. Mr. Fischer has had five years of extensive experience in the welding field.

Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., is opening a new West Coast branch office and warehouse at 778 Brannan St., San Francisco, Calif., with A. R. Bradshaw in charge.

Michigan and Illinois

Frederick W. Lucht has joined the engineering staff of Carboloy Company, Inc., 2987 E. Jefferson Ave., Detroit, Mich., manufacturer of Carboloy cemented-carbide tools, dies, and wheel-dressers. Mr. Lucht was formerly with the McCrosky Tool Corporation, of Meadville, Pa., and prior to that was connected with the Goddard & Goddard Tool Co. of Detroit, Mich.

Frederick W. Lucht, of the Engineering Staff of the Carboloy Company

Autovent Fan & Blower Co., 1805-1827 N. Kostner Ave., Chicago, Ill., announces the following promotions in its personnel: Tom Brown has been promoted to vice-president and general manager, and George J. Kalwitz has been promoted from sales engineer to general sales manager. Robert F. Ruggles, who has been manager of the New York office for several years, has been advanced to the position of eastern division manager.

Foote Bros. Gear & Machine Corporation has recently completed an addition to its plant at 5319 South Western Blvd., Chicago, Ill., which will increase the floor space 5300 square feet in the assembling and testing departments. The additional facilities were required by the increasing volume of business.

New England

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces that its subsidiary, Condit Electrical Mfg. Corporation, of Boston, Mass., is now operated as a company unit, the change having become effective January 1. The plant is now known as the Allis-Chalmers Mfg. Co., Condit Works, and is located at 1344 Hyde Park Ave., Boston, Mass. It will continue to specialize in the manufacture of switchgear products as a division of the electrical department, under R. S. Fleshiem as manager. The works organization will be under the direction of Frank W. Young, works manager, and Richard Bechtner, assistant works manager. R. H. Closson will continue as production supervisor.

Edwin E. Bartlett Co., Nashua, N. H., announces that the name of the company has been changed to the Greenerd Arbor Press Co., in order to associate it more closely with the product. W. I. Martin was elected president, treasurer, and general manager. There is no change in management or personnel.

American Chain Co., Inc., Bridgeport, Conn., has changed its corporate name to the American Chain & Cable Co., Inc. In addition to chain and wire rope, this company manufactures malleable castings; railroad specialties; abrasive cutting machines; nibbling machines; automotive service station equipment; welding wire; hoists and cranes; wrought-iron bars and shapes; valves; steel pipe fittings; and electric steel castings.

Whitney Chain & Mfg. Co., Hartford, Conn., has elected the following officers for the coming year: President, Charles E. Wertman; vice-president and treasurer, Winthrop H. Whitney; vice-presidents, Carl A. Gray and A. S. Basten; and secretary and assistant treasurer, Park C. Boyd.

Thomas H. Wilber, General Manager, Bullard-Dunn Process Division, Bullard Co.

Thomas H. Wilber was recently appointed general manager of the Bullard-Dunn Process Division of the Bullard Co., Bridgeport, Conn. This Division engineers and licenses the use of the Bullard-Dunn Electro-Chemical Process for the descaling of metals. Thomas E. Dunn, Jr., has joined the sales department of the Bullard-Dunn Process Division, and will have his offices at 309 Miller-Storm Bldg., 12015 Linwood Ave., Detroit, Mich.

New Jersey

Worthington Pump & Machinery Corporation, Harrison, N. J., reports that the company has entered 1937 with the largest backlog of unfilled orders since 1930. This announcement, coming from a manufacturer of a wide range of equipment for the construction, power, water supply, refrigeration, and air-conditioning fields, is a significant indication of resumption of activity on a large scale in the heavy equipment industry. It is an unquestionable sign of confidence on the part of these industries.

An error was made in the note announcing the change of name of Sholes, Inc., Orange, N. J., in the January number of Machinery. The new name of the company is the Orange Roller Bearing Co., Inc., instead of the Roller Bearing Co., Inc. The officers are James A. Burden, Jr., president; F. G. Keyser, executive vice-president; C. L. Ritchie, vice-president and general manager of the Bearing Division; John M. Forrest, treasurer; and A. E. Schaeffner, secretary.

R. B. Moore, Bolivar, N. Y., and Bradford, Pa., has been appointed distributor of the complete line of mechanical rub-

ber goods made by the New York Belting & Packing Co., 1 Market St., Passaic, N. J.

New York

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City, announces several additions to the technical staff. CHARLES H. LINDSLEY, a physical chemist, will specialize in the application of physico-chemical methods to the study of corrosion phenomena. He will be located at the research laboratory of the company in Bayonne, N. J. DONALD J. REESE, a foundry engineer, will carry on research work on cast iron. FREDERICK G. SEFING, formerly assistant professor of metallurgy at Michigan State College, will also be employed on research work in cast iron. RICHARD F. BARNES, JR., will be available to industry at large for technical service on problems involved in the utilization of mill products such as Monel, nickel, and Inconel for applications requiring resistance to corrosion. He will make his headquarters at the New York office. CARL ROLLE will be available for consultation on mill product fabrication problems.

PIERCE T. WETTER, who for the last ten years has been connected with the staff of the American Society of Mechanical Engineers, has become executive vice-president of the American Cutting Alloys, Inc., 500 Fifth Ave., New York City. Mr. Wetter was responsible for the development of the specialized national technical meetings of the American Society of Mechanical Engineers, of which almost one hundred have been held under his supervision. In his new position, he will have charge of the manufacture and sale of cemented-carbide cutting tools for the American Cutting Alloys, Inc. He also will become vice-president and assistant treasurer of the American Electro Metal Corporation of Lewiston, Maine, manufacturer of molybdenum and tungsten products.

E. S. BISSELL, technical adviser on industrial application in the Instrument Division of the Bausch & Lomb Optical Co., Rochester, N. Y., since 1929, has joined the Mixing Equipment Co., of Rochester, as sales manager. Mr. Bissell's duties will also include the direction of advertising and sales promotion.

FRANK J. KINNEY has joined the sales organization of the Shepard Niles Crane & Hoist Corporation, 444 Schuyler Ave., Montour Falls, N. Y. Mr. Kinney will be located at the Pittsburgh office of the company, 5405 Penn Ave., and will act as assistant to ROY W. HURST, district manager.

AJAX FLEXIBLE COUPLING CO., 12 English St., Westfield, N. Y., manufacturer of flexible couplings for direct-connected machinery, has recently completed a factory addition to provide increased manufacturing facilities.

Ohio

DEFIANCE PRESSED STEEL CO., after an interruption of seven months due to destruction of its plant by fire, resumed manufacturing operations during the month of January in its new plant at Marion, Ohio. This company, which has been in business for sixty-six years, specializes in metal stampings of all kinds in the light and medium heavy classifications, and welded assemblies. The new plant is of steel, brick, and concrete construction and covers a floor space of 100,000 square feet. It has been completely re-equipped with modern machinery. The plant will employ, it is estimated, approximately 600 men when in full production.

TIMKEN ROLLER BEARING CO., Canton, Ohio, has placed orders totaling $300,000 with various machine tool builders for new machinery and tools to increase their capacity to produce bearings for locomotives and rolling stock.

Pennsylvania and Delaware

GEORGE R. MURRAY, formerly specialist sales engineer of the Chambersburg Engineering Co., Chambersburg, Pa., has been appointed works manager of

George R. Murray, Works Manager of Chambersburg Engineering Co.

the Chambersburg plant. Mr. Murray recently completed thirty-six years with the company, having first joined the organization in 1900 as a mechanic in the erecting shop, and having since occupied the positions of superintendent and sales engineer.

HENRY DISSTON & SONS, INC., Philadelphia, Pa., recently laid the cornerstone to mark the completion of a new roll-turning shop. The building is 85 by 65 feet, of conventional steel-frame construction, with side walls and 20 per cent of the roof constructed of corrugated actinic glass to give a maximum of diffused daylight with the least glare and shadow. This addition to the plant is one step in an obsolescence program that was started in 1933, when business showed indications of recovering. Early in 1934, the work of replacing and rebuilding equipment was started. Many machines were replaced by more modern equipment, and some departments were rearranged to give a better production line and effect economies in manufacturing operations.

JOHN E. WRAY has been appointed manager of the Philadelphia district office of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., to succeed the late D. H. Kelly. He has been sales engineer with the Philadelphia office since 1919.

RUSSELL T. KERNOLL has been appointed chief engineer of welded fabrication for the Edge Moor Iron Works, Edge Moor, Del. Mr. Kernoll was previously connected with the engineering department of the M. W. Kellogg Co., Jersey City, N. J.

Southern States

LINCOLN ELECTRIC CO., Cleveland, Ohio, has opened a new office at 1015 Hanover St., Chattanooga, Tenn., with ROBERT DANIELS in charge. Mr. Daniels has been associated with the company in sales work since April, 1934. He is a practical welder, as well as a graduate engineer, which especially fits him for his new duties. He will be equipped to give practical demonstrations of welding with Lincoln electrodes and welding machines.

J. E. WELDY, 1107 S. 30th St., Birmingham, Ala., has been appointed representative in the southeast territory for the Carboloy Company, Inc., Detroit, Mich., manufacturer of cemented-carbide tools, dies, and wheel-dressers. Mr. Weldy was formerly located in the Detroit district sales office.

WARNER & SWASEY CO., Cleveland, Ohio, announces the opening of an office and warehouse at 409 Velasco St., Houston, Texas, with L. M. Cole in charge as district manager, assisted by J. V. FAL, resident service representative.

CALENDARS RECEIVED

HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION, Harrison, N. J.

CARBORUNDUM CO., Niagara Falls, N. Y.